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THE AMERICAN GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

Sixteenth Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY, August 30, 1888.

To the Members of the Association:—Gentlemen: As already announced, the Sixteenth Annual Meeting of the Association will be held in the city of Toronto, Canada, on Wednesday, Thursday and Friday, October 17, 18 and 19, and the present indications are that the gathering will be eminently successful.

The following papers are promised; their titles together with the names of the authors constitute a most worthy nucleus for the programme of the literary portion of the convention:

"Experience in Distributing Gas Under Extremely Low Temperatures," by D. H. Geggie. "Observations During Many Years' Experience in the Gas Business," by James R. Smedberg. "Construction of Gasholders with Wrought Iron or Steel Tanks above Ground," by Frederick Mayer. "The Steam Stoker and Improved Charger," by A. Q. Ross. "Daily Experiences and Observations of a Gas Manager," by James Somerville. "Gas Coals, with Especial Reference to Provincial Coal," by Jas. D. Perkins.

As will thus appear, we have six good papers already promised; but we will need several more in order to fill in nicely the time which we will have at our disposal. I trust the members will not be backward in filling in the gap. I would also say that if a member knows of another of his coworkers who has been engaged in work of special interest, and will communicate with the Secretary, an effort will be made to induce the party to give to the Association, in the form of a paper, an account of this special work.

I would repeat what I have said in former years in regard to the Question-Box—namely, if this adjunct to our meetings is to be used to advantage members should send in to the Secretary their questions at an early date, in order that mention may be made of them in a subsequent circular, thus giving the members an opportunity to come to the meeting prepared to answer the conundrums.

It may be well to remind the members—as I did more particularly under date of April 25th—of the prize which will be offered at the coming meeting for the best paper on "Naphthaline." The amount of the prize is $25.

The Committee of Arrangements having determined that neither one of the two leading hotels, the Queen's Hotel and the Rossin House, could comfortably house all the delegates, have decided to recommend both. Under this disposition of the matter ample accommodation is assured. The terms at each house are from $2.50 to $3 per day. In order to secure rooms it will be necessary to write the proprietor of either hotel, not later than October 10th. The headquarters of the Association will be at the Rossin House.

In conclusion, let me remind the members that the coming meeting will be the first one held by the Association in Canada. All who attend the convention will be sure of having a profitable and enjoyable time, and I trust the members will commence at once to so make their plans as to insure their attendance at Toronto next October.

Respectfully,

LAWRENCE, MASS. C. J. R. HUMPHREYS, Secy.

BRIEFLY TOLD.

THE opening of the calendar autumn season being upon us, we are forcibly reminded of the fact that mid-October draws near, and with it comes the annual gathering of the American Association. Gas men, of whatever political faith they may be, are undisturbed by all the rumors of retaliation, and rest securely in the knowledge that Toronto's hospitality will be strained only in respect to its ardent endeavor to make every visitor from the States feel thoroughly at home and comfortable during his sojourn within her boundaries. Secretary Humphreys' current circular to the members gives the promised particulars regarding hotel accommodations, etc., and a later one may be issued outlining possible

concessions that have been obtained from the railway managers in charge of roads connecting New York and Boston with the meeting place. The idea of securing like concessions from other central points in the States had to be abandoned, partly because of the difficulty in guaranteeing a certain number of passengers, and partly because of the jealousies existing between the managers, more especially of certain Western roads, whose particular fancy just now appears to be an anxiety (or perhaps to oblige their competitors) to live up to the strict letter of the Inter-State law. Every indication points to a most successful gathering at Toronto, and as a further reason (apart from the many suggested in the Secretary's official announcement) why a good attendance should greet President Turner's call to order, we would advise a careful perusal of our New Haven correspondent's letter elsewhere on this page. This matter of attendance also brings to mind a chance to impress upon the executive managements of gas works the value to them in a monetary point of view of causing their engineers and superintendents to be present at these gatherings; and we would add, the appropriation of sums sufficient to pay the expenses incurred by the representatives so sent. The salaries paid by the owners of gas companies to those who are responsible for the conduct of their properties are, in many instances we are sorry to say, ridiculously inadequate when measured by the results accomplished and the responsibility carried; and it is little short of niggardliness to require that the superintendent shall, out of his own pocket, pay for that which is to benefit the employer in question ten times more than the gain to the employed. The argument that the official report will furnish all the information obtainable in respect to the meetings is on a par with that which influences some directors to refuse to expend money on works improvement if the plant can be kept actually going without that expenditure. The report chronicles all that was publicly said and done; but there are some who, while unwilling to give wide publicity to certain things, are nevertheless pleased at being able to privately impart information that may on some technical point set at rest the mind of a fellow superintendent. The quiet chats and conferences are not reported but they take place, nevertheless, and always end beneficially. Pay the expenses of your representatives, Messrs. Directors; it will benefit you many times over the sum invested. It will be noted that the title of the paper to be read by Mr. James D. Perkins was incorrectly printed in our last issue. The authentic title is given in the current notice.

THE current year has been a busy one for death amongst the ranks of the American fraternity, and the grim visitor's hand has swept away many whose seeming hold on a long lease of life was most secure; but the most shocking illustration of the closeness of death to life that has been placed before us for many a day was furnished, towards the end of August, in the untimely taking off of John M. Murphy, late General Manager of the Maryland Meter and Manufacturing Company. In that stage of life which stands at the close of a well-employed and carefully tended youth, ready to enter upon the duties and realities of guarded and vigorous manhood, our associate and friend was cut down without a moment's warning. The circumstances preceding and attending his death are inexpressibly sad. He had journeyed from Chicago to Saratoga Springs, and from there went to Boston on business connected with the Maryland Company's Eastern agency. Thence his way was to this city, on a similar errand. In short, he wished to thus keep up with his business and enjoy a well-earned vacation at the same time. He arrived in New York on Saturday, August 18, intending to remain until Thursday of the following week, and a better specimen of bright and vigorous manhood could not then be found in the metropolis. On Monday he complained of stomach trouble, but his symptoms gave him no particular uneasiness at the time. On the following morning (the day was chilly, with very heavy rains) he was, when seated in the reading room of the Gilsey House, seized with a congestive chill, and on Saturday (Aug. 25) death ended all. The physicians certified that acute inflammation of the bowels was the disease from which he suffered. And thus was closed the mortal career of one who afforded every promise of an honorable and useful life. In accordance with our custom, so that the record may in all respects be properly verified, we will in our succeeding issue publish an authenticated history of his connection with the gas industry.

MR. HERMAN WILKIEMEYER, who formerly acted as Secretary and Superintendent of the Lancaster (O.) Gas Light Company, now signs himself Secretary and Superintendent of the Portsmouth (O.) Company. Lancaster's loss is Portsmouth's gain.

THE plant and franchises of the Mankato (Minn.) Gas Light Company have been purchased by Mr. Henry M. Hamilton, of Mankato. The price paid was $5,100 cash, and an assumption of the bonded indebtedness ($35,000), with accrued interest on same from Jan. 1, 1888.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

A Letter from the Superintendent of the Georgetown (D. C.) Works.

GEORGETOWN, D. C., GAS LT. COMPANY, Aug. 25, 1888.

To the Editor AMERICAN GAS LIGHT JOURNAL:

It is a relief to the ordinary mind capacity of a large number of the readers of your really valuable JOURNAL to occasionally find an article such as that which appeared in your issue of Aug. 16 (p. 110), and entitled, "How a 'Yankee' Supplied a Western City with Gas," etc. Now, while there may be but little to be learned from the article itself, beyond the fact that it proved the praiseworthy perseverance of the Monmouth Company's Manager, I say it is a relief to the ordinary manager from the many scientific solutions presented, and the numerous chemical analyses reported, and the varying wise or otherwise deductions drawn out by men who are supposed to be, and doubtless are, the true exponents of the science of gas making, but who, too often, we think, fail to so simplify the *truth* as to make it plain to the ordinary gas man—and not unfrequently, we think (and we speak from experience), rather succeed in mystifying than in explaining the subject in hand.

May I be allowed to call the attention of all such exponents to the *truism* that he who makes the truth most plain is its best expounder; and in doing so I am sure I give voice to the sentiments of a large number of earnest managers of small gas works, whose antecedents have not afforded them either the opportunities or advantages to learn from books the science of gas making, but who, nevertheless, are earnest enquirers (of those who do know these things) after the truth. The plain truth, and nothing but the plain truth, can help them to succeed.

And now allow me to furnish, in conclusion, as a matter of light reading, the following experience, which, of course, I do not advance with any idea of enlightening or edifying anyone of the fraternity, but merely to show how necessity compels thoughtful directors of small gas works to economize.

For example. It became necessary that the holder room at these works should be enlarged, and the Board of Directors having so determined, they called for specifications and bids, etc., and land was bought, and the estimates for tank and holder involved an outlay of about $15,000. Then came a halt, which was followed by the adoption of a resolution to build the new holder in the old tank; but it was necessary to use the old holder as a holder until the new one was completed.

A contract was entered into with Messrs. Bartlett, Hayward & Company, of Baltimore, and work under it was commenced about the 1st of June. The new holder was filled with gas about ten days ago, and is working nicely. It is a double-lift, and increases our holder room to, say, 125,000 cubic feet, or nearly double what it was before.

The daily output from May 29th to Aug. 11th ranged all the way between 23,000 and 64,700—the latter on August 12th—all of which I am glad to say was regularly distributed to private and public requirements without trouble or delay; and now that the work is done, and I am free to breath easy, I am sure I need only make the above known to my gas brethren when they will, as in the parable of the woman and the lost silver, rejoice with me. Yours, etc., J. D. CATHELL, Supt.

An Eastern Engineer's Trip to Toronto, Canada.

OFFICE OF THE NEW HAVEN GAS LT. CO.
NEW HAVEN, CONN., Aug. 28, 1888.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Having been in Toronto last week on a brief summer outing, I naturally paid a visit to the local gas works. In the absence of Manager Pearson, I was very cordially received by the Assistant Superintendent, who courteously attended me in my inspection of the old and new works. Those of the fraternity who will be fortunate enough to be present at the coming annual meeting of the American Gas Light Association to be held in Toronto, will find in process of construction the finest gas plant in America. An inspection of the buildings would alone repay a gas engineer who had made a long journey with that purpose in view. In my travels I have not seen any others that will equal them in solidity and finish. They are laid out to supply one million cubic feet per diem, and when completed the structures will not only outrival in architectural finish any other manufacturing establishment in Toronto, but will be an ornament to the city as well.

The machinery or apparatus was imported from England; and, as far as may be judged from an inspection of it in its present incomplete condition, it is equal to the best made in this country. The gas engineer in attendance at the meeting next October, however, will have an opportunity to compare English with American gas apparatus. Gas is sold in Toronto for $1.25 per thousand, and for power at $1; and when it is recalled that the coal used comes from Pennsylvania and a heavy import duty is levied on it, it must be admitted that the citizens of Toronto are being honestly and efficiently dealt with by the Consumers Company of their city. The many friends of Secretary Pearson will be pleased to hear that he was expected home last week* very much improved in health by his trip abroad. S. —.

* Mr. Pearson arrived in New York, *en route* home, on Aug. 24. We join with "S." our congratulations on Mr. Pearson's complete restoration to health. Now, if he will only not insist on again assuming all the burden, the improvement cannot fail to be permanent.—ED.

The Scrubbing, Condensing and Washing of Coal Gas.

At the late meeting of the North British Association of Gas Managers, Mr. Wm. Key, of Tradeston, contributed a most interesting paper on the proper treatment of gas in its passage from the hydraulic to the holders. The following is a summary of the author's remarks.

Scrubbing.—The scrubbing and washing of coal gas have of late years become almost synonymous terms; I shall, however, make a thorough distinction between these apparatus by designating the scrubber an apparatus for the extraction of the heavy condensable vapors; and no water will be used in connection with the arrangement I am about to describe for the purpose. The design (as shown on the drawing) is for the purpose of extracting the tarry and watery vapors from the gas while it is still hot. The gas flows direct to the scrubber on its leaving the hydraulic main. The passing of crude gas in pipes, along with the tar that may be condensed from it in its travel, for considerable distances is most objectionable, and should be carefully avoided. The temperature of the gas must not be allowed to fall under 120° F., and is preferably conducted to the scrubber as hot as possible.

This scrubber is designed of a capacity to thoroughly deal with 60,000 cubic feet of gas per hour, and is 5 ft. 3 in. inside diameter by about 21 ft. in height over all. The gas travels upwards for 15 ft. of this height, which is the distance between the inlet and the outlet pipe. Similar vessels may be placed in a horizontal position; and the one over the other to effect the same purpose. The outer case of the scrubber is of wrought iron, and is lined the entire length with corrugated sheet iron. A shaft passes through stuffing-boxes in the bottom and crown, to which is attached a grooved pulley, to be driven by a rope from another of a larger diameter, fixed on a main shaft, and driven by an engine; so that by frictional or other gearing one or more of the scrubbers may be set in motion as the increased manufacture of gas may demand. Keyed on to the scrubber shaft are several cast iron arms, to which are attached fans, butterfly-wings or "wipers," made of corrugated or ribbed sheet iron, as shown; or several layers of wire cloth of various meshes may be used. These are caused to rotate at a speed of about 300 revolutions per minute, whereby the gas is repeatedly forced to pass through the narrowed and irregular passage between the corrugated iron lining of the outer case and the ribbed wipers. Thereby the gas is impinged upon by the revolving surfaces; and otherwise is made to impinge upon the corrugations of the scrubber case. Thus the whole of the tarry and watery vapors are extracted. In a vessel of this size the flow of gas at the rate of 60,000 cubic feet per hour is sufficient to refill it three times in a minute; so that the wipers, revolving at 300 revolutions per minute, enable the gas in its passage through the vessel to receive 100 wipes or switches from the wipers before it passes off at the outlet completely scrubbed and clarified.

I passed about 50 cubic feet per hour of crude gas through the scrubber, at a temperature of 120° F. while it was stationary. The whole of the tarry and watery vapors had been eliminated, and the surface of the paper impinged upon remained quite clean. Having attached a meter to the outlet, both while the scrubber was stationary and in motion, it was found that there was no retarding effect to the flow of the gas. The same volume of gas was registered each time; thus indicating that the apparatus caused no back pressure. The crude gas by this new process having been thoroughly scrubbed and clarified, is now in a proper condition to be passed on to the coolers, generally termed the condenser.

Condensing.—Of all condensers, I consider that the form most destructive to the gas in its application is the pipe condenser carried in long straight lines, of a spiral form, with the pipes laid to a slight continuous fall, so that the gas might travel in contact with the tar. Then perhaps the vertical pipe condenser is the next most destructive; and along with this form I would class the annular condenser—condensers so formed that when the temperature has fallen under 100° F. the gas is passed slowly through a vessel of considerable area, and then through a small pipe, with consequently a very much increased velocity, to again enter a large vessel or chamber; and this process, repeated several times, must be very destructive to the illuminating power of the gas, and especially so as the temperature lowers, owing to the scrubbing process in these small pipes by the contact of the gas and the velocity of the impact with the cold and tarry surfaces—similar to what is frequently observable in towns where a rich gas is manufactured. The main pipe which is too small to permit of the district being supplied under a low pressure and a slow delivery, has to be put under a higher pressure. The gas passing through it at a great velocity, hydrocarbon vapors are deposited, and the rich gas, by frictional contact with such a surface and low temperature, is deprived of its light giving hydrocarbon vapors, and is found to be of a much lower illuminating power furthar on than when it was sent from the gasholders. The gas as it passes from the hydraulic main does so in the familiar condition of being accompanied, while it is still hot, by a dense brown vapor resembling smoke; the visible matter being hydrocarbon—tarry and aqueous vapors held in suspense. Any form of condenser to which the gas in this state is led which necessitates its flowing through long straight lengths of pipe at considerable velocity only serves as a means of carrying forward as far through the apparatus as possible these tarry vapors, because of the quick travel along the unbroken lengths of pipe; and, owing to the affinity tarry matter has at low temperature for the hydrocarbon vapors in the gas, the gas is lowered in illuminating value by several candles in passing through the last portion of such condensers where the temperature is low.

I have not prepared a diagram to show you what, in my opinion, is the only true principle on which to construct what would be an effective condenser; but it is enough if I say that an apparatus for the cooling of coal gas, to be effective, must, in the hands of the manager of the works, be under perfect control. The apparatus should be so constructed that one-fourth, one-half, or three-fourths of it may be thrown out of action at will. Each section of condenser should have a series of thermometers and movable discs encased in glass, to show at a glance the temperatures and position of the controlling appliances, which, in the hands of the manager, would be adjustable week by week, day by day, or even from hour to hour if necessary; and by the application of a system of levers to control the whole without in any way altering valves or gas passages, unless when a change of surface, by putting in or out of action a section of the condenser, is required. An apparatus of this kind must not have the error of all vertical apparatus now in use—the air which comes in contact with the lower portions becoming heated and ascending, and getting more heated as it rises in contact with the pipes or surfaces—extracting less and less heat from the apparatus as it reaches the top; so that the condensing apparatus should be adjustable to all possible variations, and in the hands of the engineer be controllable to a steady outlet temperature of 60° F.

In works where the gas is still maintained at an illuminating power of anything above 20 candles the adoption of the scrubbing process just described, and so clarifying the gas before it enters the condensers, will enable the gas to be manufactured much more cheaply; and the greatest benefit will be obtained by those who fix upon a standard of higher illuminating power. The hydrocarbon and other vapors that it is desirable should be taken from the gas as soon as possible after leaving the retort having been extracted by these scrubbers, the condensers will now properly perform their functions, in simply cooling the gas from 100° or 120° down to 60°; and they will remain one of the cleanest portions of the apparatus in a gas works. The exhausters will also be freed of gritty and tarry matter. By passing the gas too hot into the washers, the ammonia to be extracted is apt to remain in a gaseous state; and when the liquor gets heated above 70° it loses much of the power of absorption from the loss of affinity which water has for the ammonia at lower temperatures. The temperature of the gas is reduced in the condensers to 60° in order to better prepare it for being passed on to the washers.

Washing.—The washer is an apparatus wherein water is employed to wash the gas. The water may be quiescent, and the gas caused to bubble up through it,; or the water may be pumped up, or by other motive power made to drip through the gas as it passes through the vessel; or wetted surfaces may be rotated and exposed to the passage of the gas—all with the object of eliminating the ammonia and other impurities. The apparatus I am about to describe—in conjunction with the scrubber and condenser arrangements just mentioned—is designed so that the temperature of the gas would be prevented from being unduly cooled, and also the passage of any tarry naphtha to the washers would be an impossibility. The liquor would be made to do a maximum amount of duty, and the quality of the gas will not be impaired in passing through the washer.

Everyone knows that if a drop of water is broken up into numberless fine particles, such as mist or spray, thousands of times more surface is exposed on such a condition as compared with the surface of the drop. From this it is plain that, to get the greatest amount of work from water, instead of allowing it to pass through the gas in drops or small streams, these should be dashed into spray, so that the largest possible surface be exposed to the gas. I have designed a washer which will not only prevent the excessive cooling of the gas, but will by its powerful application in a comparatively small space, permit of the rapid passage of the gas and the maintenance of the temperature at the outlet as near 60° F. as possible; and the gas will flow through the liquor that is lashed into foam or fine spray.

This washer is very similar in design to the scrubber, but has fixed to the crown, on its under side, an annular water tank and air vessel, to

which are attached ten tubes radiating from the tank and passed through the sides of the cover to afford access for cleaning the numerous small holes in them and in the bottom of the tank. Through these holes the water falls on to the revolving corrugated iron fans or wipers. By these the water is at once lashed into fine foam or spray, and with the gas is whirled round the corrugations of the lining of the case; and the gas will be struck by the wetted surfaces of the corrugations of the fans or wipers about 200 times ere it reaches the outlet. The centrifugal action causing the gas and spray to rapidly whirl through the wiper corrugated passages outwards, I have arranged a series of bevelled trays, whereby the gas from a lower chamber, in passing upwards into the next higher one, has to pass through a 20-inch opening in the center, and the water, in falling from a higher chamber to a lower, is directed by the bevelled plates to the same opening. These plates have a large number of small holes through which a portion of the water will drip on to the revolving wipers.

From the foregoing the following claims have been brought before you as the object of my paper: (1) That the crude gas should be led, while as hot as possible, direct from the retorts to the scrubbers. (2) That a scrubber somewhat after the design I have submitted to you should be employed to scrub the gas perfectly clean from the tarry hydrocarbon and other vapors which it is desirable should be eliminated from the gas before it enters the condenser. (3) That the condensers should be employed solely as coolers, and not used as tar extractors. (4) The gas having first been clarified by the scrubbers, the condensers will remain clean if so used. (5) That the condensers, to be efficient in the hands of the engineer at the works, must be adjustable to alterations in the manufacture and variations of temperature, so that a steady outlet temperature of 60° F. be maintained. (6) That, by these arrangements, the gas will be of higher illuminating power by its passage through the condensers in a clear state, in place of the tarry condition as at present; especially so will this be the case where the gas in the condensers has been allowed to fall to a temperature approaching that of the atmosphere in severe winter weather. (7) That, by the scrubbing process and clean cooling of the gas, the washers will receive the gas in a condition to enable them to do a maximum duty. (8) The ammoniacal liquor will remain clean, and the liquor will be the more easily worked up to the desired strength. (9) The quality of the gas will not be destroyed as at present by contact with the oily and tarry surfaces of the liquor in the washers in winter.

A New Calorimeter.

Mr. Cecil H. Peabody, in the *Journal of the Franklin Institute*, describes a form of calorimeter devised to determine the quality of moist steam, and that had, after fair trial, been pronounced a success by the manipulators in the mechanical engineering laboratory of the Massachusetts Institute of Technology.

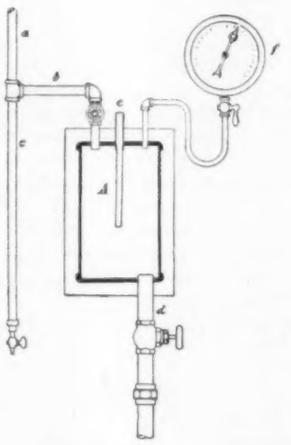
Mr. Peabody, after admitting that several other forms of calorimeters had been successfully used in the Institute, goes on to say that this one appears worthy of notice on account of the simplicity of its construction and the ease of operation. Its action depends on the fact that the total heat of saturated steam increases with the temperature or pressure, and that consequently saturated steam becomes superheated when it is allowed to expand without doing work. If the steam is moist, the excess of heat at the higher pressure, above that at the lower pressure, is expended, first, in vaporizing the water present, and, second, in superheating the steam.

In the figure, *A* is a piece of steam pipe 6 inches in diameter and 10 inches long, capped at both ends. Into the caps are screwed the several fittings required. A ½-inch pipe, *a*, brings steam to be tested; the branch *c* has a drip cock at the end, to allow the water condensed at the sides of the pipe to escape; the branch *b* leads to the calorimeter, and is provided with a globe valve which is opened a fraction of a turn to admit steam to the chamber *A*. A 1-inch pipe, *d*, diagonally opposite the mouth of the pipe *b*, allows the steam to escape at a low pressure; it is also provided with a globe valve, by which the pressure in the chamber can be regulated.

The thermometer cup *e* is made of a thin brass tube with the lower end closed, brazed into a thicker tube, which has a pipe thread cut on it, and which is screwed into the upper cap of the calorimeter with pipe tongs.

At *f* is a pressure gauge, which gives the pressure of the steam in the calorimeter. The pressure of the steam in the boiler or steam pipe from which the pipe *a* leads, should also be taken, preferably by a gauge having a separate communication; but if the valve in the branch *b* is open only a slight amount, the gauge may be attached to the pipe *a*.

The chamber *A* is covered with asbestos board and hair felt, and may be inclosed in a case of sheet metal. The pipe *a* and the branch *b* and the valve in it are thoroughly wrapped with hair felt or other non-conducting substance. It is not necessary to wrap the pipes *c* and *d*.



To make a test, regulate the pressure in the chamber *A* by aid of the valve at *d*, so that the temperature shown by the thermometer at *e* shall be higher than that due to the pressure shown by the gauge *f*. After the gauges and the thermometer have remained steady some minutes, note the pressures and the temperature, and also note the height of the barometer.

Let p be the absolute pressure in the steam pipe or boiler, and let q and r be the heat of the liquid and the latent heat of vaporization corresponding. Let p_1 be the absolute pressure in the chamber A, and let t_1, q_1, and r_1 be the temperature, heat of the liquid, and latent heat of vaporization corresponding. Let t_s be the temperature by the thermometer at e. Finally, let the mixture of steam and water in the pipe a be composed of x part of steam and $1-x$ part of water. The specific heat of superheated steam is given by Regnault as 0.4805. Assuming that no heat is lost by radiation or changed into work,

$$x\,r + q = r_1 + q_1 + 0.4805\,(t_s - t_1);$$

$$\therefore\ x = \frac{r_1 + q_1 - q + 0.4805\,(t_s - t_1)}{r}, \qquad (1)$$

and the per cent. of priming is

$$100\,(1 - x). \qquad (2)$$

The following table gives the results of several tests made in the Institute laboratory:

Gauge Pressures.		Temperature, Fahrenheit, in Calorimeter.	Per Cent. of Priming.
Boiler.	Calorimeter.		
71.2	38.5	286.7	1.1
60.3	26.8	271.8	1.2
63.0	17.5	264.9	1.3
60.6	7.0	258.8	1.1
69.0	3.7	258.1	1.2

In the use of this apparatus the following precautions are to be observed, all of which, however, apply to any continuous calorimeter for determining the quality of steam.

The boiler pressure and the pressure in the calorimeter must remain constant for some minutes before the test is made, so that the whole apparatus shall be at a constant temperature, and neither receive nor give up heat save that taken from the steam to supply the external radiation. In this calorimeter no attempt is made to correct for radiation, but it is probable that the temperature of the steam in the center of the calorimeter is not much affected thereby. The errors of the gauges and the thermometer should be known from recent determinations. It is to be noted that if the steam is superheated 5° or more, an error of 2° in the temperature will have a very slight effect on the result. The gauges used should be divided to single pounds, and should be compared with a reliable mercury column. The gauges on the market, though sufficient for ordinary use, are seldom accurate enough for this work, and they are liable to change during use. Unfortunately, a comparison of gauges with each other is of little avail, since the errors vary irregularly.

The application of the calorimeter is limited to cases which have a small or moderate per cent. of priming. If the priming is excessive, the steam in the calorimeter will fail to be superheated. For any range of pressures the limit may be determined by a calculation similar to that of

equation (1), making $(t_s - t_1) = o$. Thus, with 100 pounds absolute pressure in the boiler and atmospheric pressure in the calorimeter, the steam will fail to be superheated if the priming exceeds 4 per cent. With lower pressures the limit is smaller, and with higher pressures it is larger. If the pressure in the calorimeter is less than that of the atmosphere—for example, if the pipe *d* communicates with a condenser—the limit will be increased.

The calorimeter described is the first one made, and it has been used just enough to show that consistent results can be attained. It is proposed to make others of different sizes, and to make further experiments and comparison with other types of calorimeters.

Automatic Gas Lighting.

By George Keillor.

[We are indebted to the London *Journal* for the following reprint of Mr. Keillor's paper, read by him at the last meeting of the North British Association of Gas Managers.]

From the fact that the automatic system of gas lighting by means of an electric spark has been in practice for a few years and applied in many different ways, all with considerable success, and also from the fact that a considerable number of able papers have been read on the system at previous meetings of the Association, the subject is one which is well known, and one upon which it is difficult for me to add anything likely to be of more than passing interest.

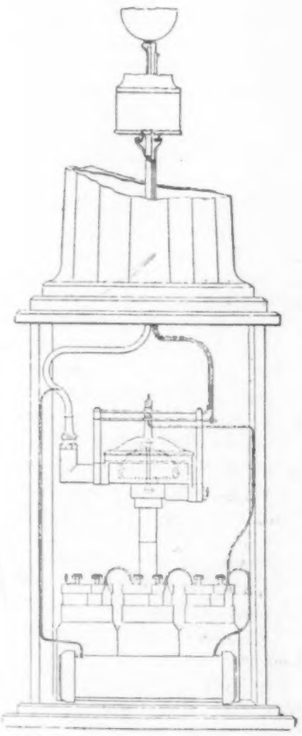
At the outset, I wish to explain that it is not a lighter I have made, but an arrangement whereby these lighters can be used to much greater advantage than formerly. Before proceeding further I wish to emphasize the fact, in case of misunderstanding, that I have not come forward to read this short paper with the intention of making it appear that I can in the slightest degree improve these lighters so far as they are in themselves concerned. The Woodhouse & Rawson Company's electric lighter is a most complete instrument; and having had one in use during the whole of last winter, I can certify to its unfailing accuracy in the lighting of public lamps, when fitted up in such a way as I am about to describe.

With your forbearance for a short time, I propose to describe a system of lamp lighting which I have had in practice during the past winter, whereby the pressure of gas, by means of a governor combined with one of these electric lighters, operates as a complete automatic lighter; but before putting the model which you see before you in action, it may be interesting to the meeting if I were to give a short account of the circumstances under which I was led to make an experiment of the system under description, and the difficulties that I experienced in connection with the lighting of a pier-head lamp.

The pier at Nairn is about 200 yards long, and runs straight out into the Moray Firth. In 1884 the seafaring population of the town made application to the Police Commissioners for the erection of a lamp at the outer end of the pier, to serve the double purpose of helping the navigation of the Firth and lighting the entrance to the harbor. In the following year the Commissioners, conscious of the necessity for the request, agreed to erect a lamp, and asked me for a probable estimate of the cost of extending the gas main and furnishing and fitting up a lamp. As requested, I submitted an estimate, at the same time informing them of the difficulties of carrying the gas main along a pier, and the trouble likely to arise in lighting a lamp situated at a pier-head, owing to the sea being at times very stormy. However, I was entrusted to get the work carried out; and the lamp having been erected in October, 1885, was registered as a coast light.

The light was all that could be desired, giving satisfaction to both the Commissioners and the seamen. All went well until the first storm, when, as I fully anticipated, my troubles in connection with the lighting of the lamp commenced. With the waves washing right over the structure, the lamp lighter—I mean the animate lamp-lighter—dare not venture to the point of the pier to light the lamp; and yet it was just upon such a night as this that the lamp was most needed. To dispense with the necessity of going to the point of the pier at all I fitted up a burner with a bye-pass, so as to burn at a low point all day; but, unfortunately, the jet of gas when lowered often got blown out in gusty weather. Another objection was raised to this system in respect of the waste entailed by the burning of gas during the daytime; and hence it was that I was induced to adopt the automatic system which I am now about to describe.

I purchased one of Woodhouse & Rawson's electric lighters, with the necessary battery, etc.; and after experimenting with it at the gas works I contrived to combine the lighter with a governor constructed in the way shown in the model before you, which entirely obviated the necessity for laying a wire to the pier-head—a distance of about 500 yards. I need not comment on the difficulty which would be entailed by carrying a wire alongside a pier further than to say that I was exceedingly pleased to get over the difficulty so easily. After affixing the wires to the governor in the permanent way shown in the model, I did not experience the slightest trouble; and as sure as the pressure at the gas works is put on, so sure will all lamps fitted with this apparatus light up.



The model, or rather the box and pillar shown is simply a rough and ready means of showing the apparatus combined; the battery and governor inside the box and the lighter on the top being actually the apparatus I had in use during the past winter. Now assume that I am at the present moment in the governor house at the gas works; the minimum or day pressure being, say, 10-10ths. The governor fitted inside the lamp post is set at 12-10ths. Consequently it is down and the lamp out. Evening, however, comes on; and it is time to commence to load the station governor, so as to increase the pressure in the street mains for all purposes. We will accordingly now put on the first of the weights; and the moment the pressure reaches (say) 13-10ths in the street mains all the lamps (unless the governor be loaded down to suit the time) fitted up on this system will immediately light up, as I will show by operating on the apparatus before you. Having now increased the pressure so as to raise the governor and connect the current—the lamps burning—we will suppose the pressure to be all on. Everything goes on as usual until the time for reducing the pressure; and if it is wished to extinguish any lamp (say) at 11 o'clock, or at any given hour, it is accomplished by simply loading the governor at the lamp so as to suit time and elevation. But this one being, we will suppose, a night lamp, goes on burning till day-break; and seeing that the pressure has been reduced during the night and morning from the maximum to the minimum, the last of the weights will now be taken off, and you will observe that the moment the pressure is reduced to its minimum the lamp will instantly go out and remain so till evening.

Although the model before you only shows one lamp lighted up, I wish to explain that rows of lamps can be lit by means of one governor and battery, and that it matters not from what main the different lamps may get their supply; but there must be a lighter on each lamp, so as to convey the current and turn the gas on and off. For a row of 10 or more lamps, it is simply a matter of battery strength; and it makes no difference what the number of lamps may be, so far as the governor is concerned—it being there solely for the purpose of connecting the current.

I am confident that this is a system of gas lighting which will com-

mend itself to all in charge of public lights. It is specially suitable for pier-head signal and night lamps, as well as for town, steeple, and public building clocks—in fact, wherever gas is used. For town and steeple clocks the system is exceedingly useful, and will entirely supersede the rather antiquated practice prevalent at the present time of setting the clock from time to time to turn up and down the gas according to the season of the year, and it also effects a saving of the gas burned in these clocks during the daytime. In short, I am of opinion that there can scarcely be a more accurate system of automatic lighting than the one I have shown. When night approaches, the pressure at the gas works will be put on to suit the season of the year according as the day shortens or lengthens. Hence, by means of an apparatus fitted in connection with the gas supply of any public clock, building, or lamp, set to a certain pressure, the time of lighting and extinguishing would be wholly regulated by the man in charge of the station governor at the gas works —thereby making the system completely automatic and thoroughly satisfactory.

Of course the electric lighter with battery can do all I have mentioned without the aid of a governor if a push-button can be conveniently placed, and a wire carried to the required place, so as to perform by hand the duty which the governor does automatically; but in all cases such as I have described, and also in all outlying lamps, the governor which I have had the honor of bringing under your notice is, in my humble opinion, by far the preferable appliance. Of course, there are a great many other places where these electric lighters could be used, and where they would be exceedingly useful and economical; and it is surprising that they have not ere now come into more general use, especially where occasional lamps are required.

I will briefly mention a few of the more likely places where they would be of very great service. They would be particularly so at railway stations, especially in smaller towns where there is generally a considerable lapse of time between the trains, and where a light is only required for a passing train. All outside lights could be lighted instantly, by the use of these lighters, a few minutes before the arrival of the train, and put out again the moment after its departure. Facilities for fixing up the lighters at railway stations are exceptional, as the batteries are at hand, and nothing further is required but the additional lighters and wires. In hotels and large dwelling houses, also, the system would be one of the greatest public convenience. In these establishments one sleeping in the top of the house may have occasion to go to the ground floor during the night, when on coming from his room, and by pushing a button placed at a convenient point, the staircase would be immediately lighted up, and when returning to his quarters, by pushing an adjoining button, darkness would again prevail. This system of the push button will be found to be equally serviceable in flats of spinning mills, factories, and in show and sales rooms, doctors' surgeries, etc.

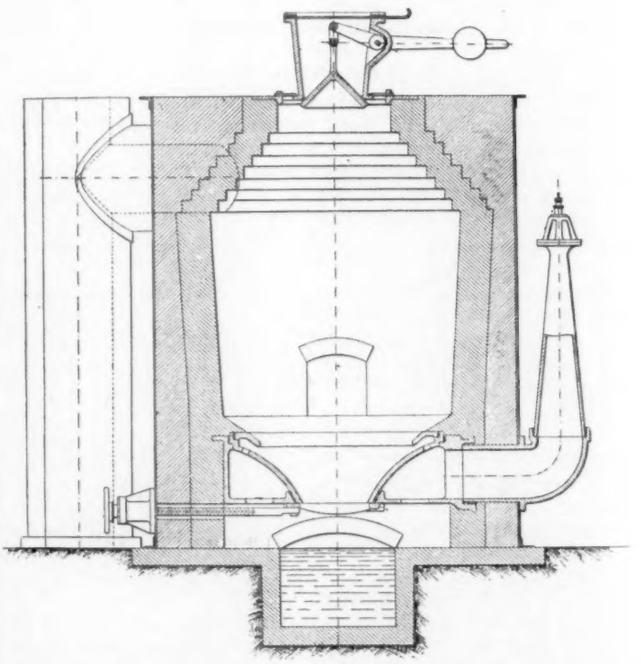
The cost of the combined automatic lighting appliance as you now see it is about £4 10s., including the cost of the governor. This governor, of course, I made to suit myself; but to light up a row of 10 or more lamps, which would necessitate a few extra cells to be added to the battery, and an additional lighter for each lamp, the total expense would be about 45s. per lamp. Extra cells cost 2s. 6d. each, and the best special wire about 6s. per 100 yards. The lighter and battery will last for a number of years; and all that the battery requires at any time is simply to be replenished with a little plain water added after the sal-ammoniac, zinc, and carbon blocks.

I may here further state, for the benefit of anyone who may think of using a similar apparatus in the close vicinity of the sea, that damp from the salt water, or even the sea air, has a very injurious effect upon all metals, and especially copper, which in a very short time gets quite green in color, followed rapidly by verdigris; and if not protected, corrodes the wire connections in a very short time. All wire connections should therefore be carefully covered up by whatever means may suggest itself. The means of protection which I adopted was to completely bury the battery in a sheet of common wadding, with a close case to cover the governor, above which I also placed a sheet of wadding.

Sheel's Gas Producer.

The accompanying figure affords an excellent illustration of a gas producer recently patented in England by Mr. John W. Sheel, of Malvern Link; and while we are disposed to believe that good results can be obtained from it, we nevertheless incline to the view that the inventor's ideas in regard to its effectiveness are, to say the least, somewhat extravagant. Mr. Sheel asserts that with an apparatus of the size especially favored by him (from 9 to 10 feet in height and 8 feet in width, external measurements), 4 cwt. of soft coal can be gasified in an hour, and that each ton of coal (2,240 lbs.) will yield 150,000 cubic feet of mixed gas, at a cost of, say, 3.5 cents per 1,000. In describing the producer Mr. Sheel says:

The producer consists of a wrought iron casing lined with brickwork, into which, near the bottom, is built an annular cast iron tuyere or blast box, fitted with a movable grate or grid. The air for combustion passes through this grate, which is adjusted or moved by a screw on which is fixed a handwheel. When the grate is drawn clear of the bottom opening, the ashes and clinkers fall into the water-trough beneath.



The coal is charged about every half hour through the bell and hopper, the gas producer being kept about two thirds full. The air to promote combustion is forced in by a steam jet blowing down a tapered pipe. In the center of the blast box passes the principal portion of the air, but a little passes through the upper holes, by which means an equal distribution of air is obtained to promote uniform combustion.

The gas is delivered hot and under pressure through an outlet near the top of the producer, after which it is usually taken through the downcomer, in which is a valve for shutting off the gas, into a brick culvert beneath the ground line, thence to the furnace or required application.

The special feature in this gas producer is the annular blast box with its movable grate or grid, which enables the attendant to clear the producer of the clinkers and ashes without any stoppage in the production of the gas, thereby giving a continuous and uniform supply of gas.

This gas producer has been designed to furnish a simple, reliable, and economical means of supplying gas for manufacturing purposes. Slack coal only is required. There is no coke left, as the whole of the fuel is converted into combustible gas. The producer can be closed up and combustion suspended for 36 hours if required. It will start again almost immediately. This is an important feature in firing boilers, for which this producer has been very successfully employed.

Brick as a Building Material.

By Prof. R. T. Brown.

Primitive man probably occupied a semi-tropical climate, where he needed but little protection from cold, and a tent made from the skins of animals served to protect him from other inclemencies of the weather. When his migrations carried him further into the temperate zones he at first would naturally seek protection from the cold in caves among the rocks. This would probably lead him to the construction of artificial dwellings of the same material. But many broad and fertile plains and valleys existed which afforded good hunting ground and rich pasturage where stone could not be procured to construct even a rude hut, and

without metal tools the construction with wood would be both laborious and tedious. The obvious resort would be to clay at first; no doubt in the form of sun-baked adobes, but later, as the earliest historic record has it, they burned them thoroughly and had brick as a substitute for stone. The almost universal distribution of clay in almost every habitable country would naturally lead to its early use as a building material. Its use was no doubt more general in the prehistoric age than we have any visible evidence of to-day. Wood was the only known fuel for burning brick, and to prepare it without the aid of metal tools was a difficult task which would be undertaken only on special occasions. Ordinarily, structures for various purposes would be made of sun-dried clay, which, except in rainless regions, would in time return to its original condition. It is not at all improbable that the mounds which remain as footprints of a prehistoric race that once inhabited this country were originally built with adobe. A true prehistoric mound is always built of clay, though the ground on which it stands may consist of sand and gravel that would require the transportation of clay from a distance.

We are just now in this country passing through an era of wooden buildings, and present indications suggest that this age is rapidly nearing its close, from necessity if not from choice. The enormous consumption of wood in the various demands of our modern civilization will soon render that article too expensive to be used in ordinary buildings. For floors and other joiner work wood will continue to be used, but for walls and roofs some less expensive and more durable material must be substituted.

That brick will be the building material in general use in the coming age we infer, first, because of its durability. We may have stone that will be as durable in a building as well burned brick, but it is rare, and but few architects have acquired the skill of selecting it. If we walk around the city and examine the buildings that were constructed fifty years ago, we will find the brick in a much better state of preservation than the stone. Moreover, the brick of that period generally fell below even a medium quality, while most of the stone was from quarries that are yet regarded as furnishing a superior building material. Brick made of good clay and well burned is practically indestructible, except by a force that will crush it into fragments. It is proof against all chemical agents, and although it absorbs water quite freely, yet it has sufficient elasticity to endure expansion in freezing without injury. All its component parts being perfectly insoluble it will remain under water indefinitely without injury, and no degree of heat will affect it that will not fuse iron and destroy granite. The durabiliiy of brick walls is very much affected by the character of the mortar used in laying the brick, and in the condition of the brick when laid. Clean, sharp sand, and rather coarse, should be used for mortar, and the lime should be water slacked and fresh. Mortar is sometimes weakened by the use of too great a proportion of lime, used with the intention of making it strong. If the brick is laid dry, the mortar will be robbed of its water the moment it touches the brick, and will fail to harden and form a cement. A good brick wall should break anywhere else as soon as between the bricks. In inspecting the old walls we have observed that the first sign of decay is in the mortar forming the joints. The mortar should be as hard as the brick.

2. In order to maintain as uniform a temperature as possible in a building it is important that its walls should be composed of material with a low conducting power, with regard to heat and a good capacity to retain its temperature uniformly. In these respects no building material excels well burned brick. A house with a brick wall twelve inches thick, even without air chamber, is easier kept uniformly warm in winter and cool in summer than with a wall of any other durable material; and if an air chamber is introduced between the inner and outer walls its capacity in both these directions will be increased. Complaints are sometimes made of the dampness of brick walls, but this is always the fault of bad material or bad construction. Brick imperfectly burned will absorb much water, and will retain it long, but if the outside of the wall be made of hard burned brick no amount of rain will so wet it as to transmit moisture to the inner surface. The ascent of dampness from the foundation by capillary attraction may always be prevented by interposing a layer of roofing slates between two courses of brick about the level of the lower floor. In cold weather if fire is occasionally kindled in a room water will frequently condense on the cold wall from the contact of warm moist air with it. This may be prevented by keeping the doors closed till the surface of the wall begins to warm up. In occupied rooms which are warmed daily there is seldom any complaint of dampness in brick walls.

3. Building material should not only be such as to make durable and comfortable walls, but we owe something to good taste. Houses should have a cheerful and comely appearance without the addition of artificial ornament. This can be secured in a brick wall more readily than in one of any other material. If care be taken in the selection of clay, and especially in the choice of molding sand, brick of a uniform color may be obtained, and with proper selection of front brick, a wall may be made that will be elegant in its very simplicity. If desired openings may be trimmed with brick of a different shade to suit the taste of the proprietor. We confess an admiration for the plain brick walls of Philadelphia, which were built 200 years ago, of imported brick, by the Quaker founders of that city of "Brotherly Love." They promise to endure for centuries yet.

4. A building material should be so abundant as to be inexhaustible, and so distributed as to be accessible to everyone and yet be easily worked as to require no high degree of artistic skill to put it into such a form as to be fit for the builder's use. No substance fills all these indications so perfectly as does clay, and this points to brick in some form or mode of manufacture as the future building material of civilized man everywhere, in country and in city. Though brick is among the oldest products of human industry, yet its manufacture is in its infancy. It is scarcely a century since any other power than human muscles was used in preparing clay for a wall; and when we see the effect of the application of steam power in the manufacture of other articles in reducing the cost of the product, we very naturally anticipate the time when brick will be the cheapest, as it is the best building material, and will, in consequence, be in universal use. Brick is destined to be a commercial article, and to this end manufactories on a large scale must be established, and varieties, both in form and color, will be introduced to accommodate the various tastes of builders. The recent development of natural gas as a cheap source of power for manufacturing, and of fuel for burning, will invite the attention of enterprise and capital to this field, which promises so much in wealth to the manufacturer, and in comfort to the masses.

The Decision in Respect of the Invalidity of the Edison Patents in England.

The trial on the merits of the case of Edison vs. Holland and others occupied the attention of the Court for something over 21 days, the judges reserving their decision at the conclusion of the arguments. Mr. Justice Kay, on July 19, handed down the opinion; and in view of its importance in regard to possible future litigation in the same direction in this country, we herewith give an abstract of the decision.

The action was brought by the plaintiff company to restrain an alleged infringement of their patents by the defendants, Mr. William Holland, the Manager of the Albert Palace, Battersea (where the incandescent lamps had been used which, it was said, were substantially the same as those protected by the plaintiff's patents), the Jablochkoff and General Electricity Co. (Limited), who had supplied the lamps used at the Palace, and the Anglo American Brush Electric Light Corporation (Limited), who were the manufacturers of them, and had entered into an agreement with the Jablochkoff Company to indemnify them against the litigation. The patents upon which the plaintiffs sued are the same as those they succeeded in maintaining in the Court of Appeal last year, in two actions by them against Messrs. Woodhouse & Rawson—namely, the Edison patent, No. 4,576, of 1879, for the incandescent lamp, and the Chesebrough patent, No. 4,874, of 1878, for a mode of making uniform the carbon filament or thread which forms the light-giving portion of the lamp. The cases against Messrs. Woodhouse & Rawson will be found reported in the London *Times* of May 23, 1886, and Feb. 13, 1887; also in the *Times* law reports, vol. 2, pp. 654–656; and vol. 3, pp. 327, 367. During the delivery of Mr. Justice Kay's judgment, which occupied nearly an hour and a quarter, the Court was crowded to excess with persons of eminence in the scientific world, besides the general public.

Mr. Justice Kay said: The plaintiffs sue the defendants for infringing two letters patent—one, Edison's patent, No. 4,576, of Nov. 10, 1879; the other, Chesebrough's patent, No. 4,874, of 1878, amended by disclaimer dated the 12th of November, 1884. Both patents relate to electric incandescent lamps. The defense is taken up by third parties, the Anglo-American Brush Electric Light Corporation. The validity of both patents is put in issue. The first thing necessary is to ascertain as accurately as is possible to anyone who has not had the requisite scientific training, what was known on the subject at the date of these patents—say in 1879. There are two commonly-known systems of electric lighting—the arc and incandescent systems. These patents relate to the latter. The former depended upon a break in the conducting material occurring at a point where the conductor was carbon in the form of a pretty thick pencil. The current leaped over the break in an arc, gradually destroying the carbons; and this arc gave a vivid white light,

especially at the positive pole. The incandescent system is different. The conducting material in this is continuous, without any break or actual interval; but, being in part an imperfect conductor, that part becomes heated by its resistance to what is called the passage of the current, and this heat ng, raised to an intense degree, gives the light (now familiar to us) in the incandescent lamp. The material which is now so heated is some form of carbon. It was well known that this was a good material for the purpose, because it was an imperfect conductor—in other words, had a high specific resistance—and that it was essential to use it in a vacuum or in some gas or vapor which did not contain oxygen, otherwise the carbon consumed quickly. Until 1872, when Sprengel's air pump was improved by Mr. Crookes, it was difficult to obtain a vacuum which was complete enough. The consequence was that it was necessary to employ a pencil of carbon of comparative thickness, because there was enough oxygen left within the exhausted glass bulb to occasion some consumption of the inclosed carbon, and also enough air to diminish the bulk of the carbon when incandescent by frictional action upon its heated surface, which Edison in his specification and some of the witnesses have called "air-washing." Another difficulty which prevented the use of very slender carbons was the irregularity of the current obtained from the dynamo. It was subject to variations, which at times produced a current stronger than the carbon could bear. This was remedied by the improvements of Gramme and Brush, which were perfected in the year 1878. Two modes of improving the resistance of the carbon were known—one by increasing its length, the other by the diminution of its thickness, or, to use the more exact language of the witnesses, of its sectional area. It was known that the carbon for an incandescent lamp must be inclosed in a glass bulb from which the air must be exhausted. Bulbs made entirely of glass had been used and publicly exhibited for this purpose. It was known that molten glass could be made to adhere closely to platinum wires, because the glass proper for the purpose expands with heat in the same degree as that metal, and that for this reason, and also because of its properties as a conductor of electricity, the best mode of connecting the carbon within the glass bulb with the main wires through which the current passed, was to unite each end of it to a thin platinum wire, and to fuse the glass round these wires so that air should not penetrate at the points at which they entered the bulb. It was known that by increasing the electromotive force the main wires bringing the electric current to the lamps might be reduced in size, just—to take the illustration given by Sir F. Bramwell—as by increasing the hydraulic pressure in the pipes supplying a town with water, you are enabled to use smaller pipes, because the water will pass with accelerated velocity. It was known that by using high resistance in the incandescent portion of the lamp smaller leading wires might be employed, and also a greater number of lamps might be illuminated from the same source of electricity by working them, as Dr. Hopkinson calls it, in multiple-arc or in parallel. Two systems of using incandescent lamps were known, and it was recognized that when many lamps were to be lighted from one central station, and at some distance, the system called "multiple-arc" or "in parallel" was best. That may be shortly described as a plan involving the use of one main leading and one return wire, each lamp being supplied with electric current by a smaller wire from the main leading wire, and returning such portion of the current as it took to the return wire, the main leading wire and the return wire being supposed to be parallel. The other system, which is little employed, was the use of lamps "in series." In this case the whole current is sent through each lamp in succession, and accordingly lamps of comparatively low resistance are required. The desideratum, in 1879, was to obtain lamps of high resistance for the "multiple-arc" system, which could be made "commercially"—that is, in large quantities with reasonable cheapness, and, above all, that should have durability. Edison, Lane-Fox, Swan, and others had been working with this object in the same direction. On the 19th of December, 1878, in a lecture given by Swan at Newcastle, he described an experiment on the production of light by passing a current of electricity from a dynamo through a slender rod of carbon inclosed in an exhausted globe. On January 17, 1879, he lectured on the same subject at Sunderland, illustrating his lecture by experiments, exhibiting certain electric lamps. On the 4th of February, 1879, he again lectured at Newcastle, and he then exhibited the lamp which has been produced in evidence. It consists of a bulb made entirely of glass, with leading platinum wires sealed into it and connected with a pencil of carbon inside the bulb. This piece of carbon was obtained from Carré, of Paris, and was manufactured by him and shaped before being carbonized. It is $\frac{1}{25}$th of an inch in diameter—that is, considerably thicker than the carbons now used; and, being straight, the leading wires are sealed into the bulb at opposite ends. This renders it liable to a defect which is alluded to in the correspondence between Swan and Mr. Stearn—viz., rupture of the carbon, or its separation from the wires by expansion and contraction under the great heat to which it is exposed. This lamp was exhibited again at Gateshead on the 13th of March, 1879, and seems to have been kept lighted from 10 to 20 minutes at a time on two or three occasions without injury. I have no evidence to show how long it would last if continuously used. Swan, in the spring of 1879, ordered from Carré carbons in the shape of a hairpin, a model of which he produces. It is practically identical in form with some of the carbons now used in lamps, but with a larger sectional area. Lamps made with these would not have the defect to which I have alluded. He says that probably towards the end of 1879 he made some lamps with those hairpin carbons. They are referred to by Mr. Stearn in a letter dated the 26th of November, 1879, in which figure 2 is a sketch of a lamp so mounted; but I do not lay much stress upon this as an anticipation of Edison, for, although Heaviside and other witnesses speak of having seen these lamps in 1879, I think the fair result of this evidence is that these were experiments which did not succeed in producing a commercially successful result before Edison's patent. On the 2d of January, 1880, Swan obtained a patent for one of the most valuable inventions connected with the manufacture of incandescent lamps. This was for preparing the carbon by passing the electric current through it, and heating it to incandescence while the bulb was still connected with a Sprengel air pump in action. This is now always done, and the effect is to make the vacuum much more perfect, or, rather, less liable to be impaired by air or gas coming from the carbon itself when first heated in a vacuum. On the 21st of January, 1880, he obtained a patent for a horse-shoe strip of cardboard prepared for an incandescent lamp by converting it into a substance like parchment by treatment with sulphuric acid and then carbonizing. On the 27th of November, 1880, he obtained a further patent for the application of this process to cotton thread. This has proved a most valuable invention. It produces a non-structural, tough material, said by one of the witnesss to be as hard and stiff as a metallic wire; and this is now largely used for incandescent lamps. Mr. Edison applied to the object of producing a lamp of high resistance his untiring and apparently inexhaustible ingenuity; but his specification shows—as Sir F. Bramwell states—that he was not aware how much was actually then known to electricians like Lane-Fox and Swan, and Edison conceived that he was the first inventor of some matters in which they seem to have anticipated him. Edison availed himself of the more perfect vacuum obtained by the Sprengel pump, and also of the known principle of increasing the resistance of the carbon by diminishing its sectional area, which had become possible to a much greater degree owing to the perfecting of the Sprengel air pump and the dynamo.

The most important point raised upon the construction of his patent of November 10, 1879, is the extent of the second claim—whether it includes every lamp of the kind there described, the light giving carbon in which is a "filament;" or whether it means only lamps with such filaments as are particularly mentioned in the body of the specification. Another point is upon the first claim, whether the word "lamp" in that claim does not mean merely the filament of carbon. A third question of construction is whether the carbonization of the filament is to be effected before or after it is attached to the platinum wires. With respect to the sufficiency of this specification, it is urged that Edison ought to have defined exactly what was meant by the word "filament," and that his patent of 1879 is void for insufficiency of specification in this respect, and also because it does not give sufficient directions for carbonizing filaments. None of the modes of making filaments particularly described, it is said, are practical; or, at any rate, some are not, especially the several modes of making filaments from a putty composed of lampblack and tar, and from that putty compounded or coated with various substances. Also, if the patent means that the filament is to be carbonized after being attached to the platinum wires, this, it is said, is impracticable, because the platinum wires would thereby be made porous and brittle, and could not be sealed into the glass so as to prevent air getting in at the point of sealing, or through the pores in the wire.

His lordship then referred to "Neilson v. Harford" (8 "M. and W.," 806, and "Simpson v. Holliday") (12 "W. R.," 578, "L. R.," 1 H. L., 315) as to the proper mode of construing a specification, and proceeded: With regard to the construction of Edison's patent, No. 4,576, of 1879, I observe, first of all, that the provisional specification begins by stating the necessity that lamps connected in multiple should be employed without main wires of great size, and that it is essential that these lamps should have a high resistance. It is stated that this had been set forth in a previous patent of Edison's of the same year, and that lamps of great resistance had been obtained by a long wire of platinum or other metal pyro-insulated (which means coated with an incombustible sub-

stance), and coiled so that but small radiating surface was exposed. Then it is said that the present invention relates to lamps of a similar character, except that carbon threads or strips are used in place of metallic wire, and connected to platinum wires, sealed into a bulb exhausted of air. A description of the mode of manufacture is then given, but not in so much detail as in the complete specification. Turning to that I find that it commences with a short statement that the object of the invention is to produce incandescent lamps of high resistance. Then follow four paragraphs stating in what the invention consists. The first of these is the coiling of carbon wire or sheets so as to offer great resistance, and present but a slight surface for radiation. The next the placing of such light-giving body of great resistance in a nearly perfect vacuum. The third states that the connecting wires are platinum, sealed into the glass. The fourth is the method of manufacturing carbon conductors of high resistance, and securing perfect contact between them and the wires. The specification next states Mr. Edison's view of what had been done up to that time. It is admitted that this is inaccurate in many respects. He appears to have been unaware of the attempts that had been made to do the very thing at which he was aiming—that is, to increase the resistance of the carbon burners in lamps made of bulbs of glass exhausted of air, the connecting wires being of platinum sealed into the glass. He seems ignorant that bulbs made entirely of glass had been used, or that they had been exhausted of air so as to form a vacuum.

His lordship then read Mr. Edison's description of the several modes of making the carbon burners, and proceeded: Then come the claims, which are four in number, "(1) an electric lamp for giving light by incandescence, consisting of a filament of carbon of high resistance, made as described, and secured to metallic wires, as set forth; (2) the combination of a carbon filament within a receiver made entirely of glass through which the leading wires pass, and from which receiver the air is exhausted for the purposes set forth; (3) a coiled carbon filament or strip, arranged in such a manner that only a portion of the surface of such carbon conductor shall radiate light as set forth; (4) the method herein described of securing the platina contact wires to the carbon filament and carbonizing of the whole in a closed chamber, substantially as set forth." I do not agree that the word "lamp" in the first claim means only the "filament of carbon." The claim is, "an electric lamp for giving light by incandescence," which the filament alone could not do. The words "consisting of" are inapt, but the wording of the whole specification is exceedingly inaccurate, and this is only an example of such inaccuracy. "Containing" would have been a better word. I construe this claim to mean lamps such as described in which the distinguishing features are carbons of "high resistance, made as described, and secured to metallic wires, as set forth."

After commenting on the other claims his lordship proceeded: The claims, as I read them, are—(2) a combination of four requisites for a lamp; (3) and (4) claims for two of those requisites separately; and (1) a claim for particular modes of making and attaching to platinum wires the first item of the combination—viz., the carbon filament. But claim (2) comprehends lamps containing carbon filaments, however made, and not only those made in the special modes described in the body of the specification and included in claim (1). The defendants construct incandescent lamps with all the four elements of the combination described in Edison's second claim. But the filament made by them is essentially different from anything particularly described in Edison's specification. His lordship then described the defendant's mode of making the filament used by them, and continued: As I have come to the conclusion that Edison's second claim is wide enough to include any lamp with a carbon filament, however made, the defendants have clearly infringed this claim. Then comes the serious and important question whether so wide a claim can be supported. I have already pointed out that the only item of the combination which had any novelty was the use of the filament or "very slender thread" of carbon. Edison had managed to use carbons thinner than anyone had used previously. The only advantage of a "filament" suggested in the specification is its high resistance by reason of its thinness or small sectional area. There was no invention described in this specification of any new principle. The principle of increasing resistance by diminishing the sectional area of the carbon was known, and had been published by Lane-Fox and by Swan before November, 1879. Assuming that Edison had been the first successfully to put that principle in practice by the methods described in his specification, did that success entitle him to say, "No one shall make a lamp with a filament of carbon but myself?" Suppose the claim had been thus worded: "I have succeeded in making an electric lamp with a carbon burner, say, $\frac{1}{100}$ of an inch in diameter, which gives a high resistance, and I claim a monopoly of all lamps with carbon burners not thicker than that, however made." Could such a claim be supported? That, in effect, is Edison's second claim. One of the objections made is that the claim ought to have been worded in some such way as I have just suggested in order to make it sufficiently definite. In other words, Edison ought to have indicated the exact boundary between his "filament" and such a Carre carbon as Swan had successfully used. From the drawings and from the great stress laid upon coiling the filament, the only object of which seems to be to increase resistance by using a considerable length, I should conclude that Mr. Edison did not conceive that extreme thinness of the carbon was practicable. Mr. Swan had tried paper, cardboard, and similar materials carbonized, and, if he had not tried a "filament," he had used and obtained considerable success with Carre carbons not more than $\frac{1}{2}\frac{1}{5}$ of an inch in diameter. He was trying these in the form of a hairpin made and shaped to that form before carbonization; and it seems impossible to say that Edison, by reducing the thickness of the horseshoe carbon, had made any vast invention or contributed largely to the knowledge which such inventors as Swan and Lane-Fox already had on the subject.

His lordship then referred to "Jupe v. Pratt" (1 "Webst.," 146) as an authority on the right of an inventor to be protected in patenting a practical mode of applying a new principle discovered by him, and proceeded: But is there any decision that an inventor who has discovered a mode of applying a known principle like this, of increasing resistance by diminishing the sectional area of the carbon burner, can obtain a monopoly of the principle? Sir F. Bramwell, in his evidence for the plaintiff, put the case in the strongest and most favorable manner by saying that Edison made the first commercially successful incandescent lamp. Unless that is so his claim to so large a monopoly would not, in my opinion, be arguable. I proceed to inquire—Did he make a commercially successful lamp—that is, were any of the modes of making lamps particularly described in the specification commercially successful? Justice Kay then referred to the numerous other electric patents taken out by Edison, and proceeded: The plaintiffs have been challenged again and again during the cross-examination of their witnesses to prove, if they can, that any lamp with a burner made according to the description in the body of the specification of November, 1879, has been brought into the market in England or in America. No evidence of this has been given, and I conclude that there was no commercial use of the invention of that kind. Until he had taken out his subsequent patents it seems that Edison did not introduce any lamp to the public.

The Justice then referred to certain experiments which had been made in constructing lamps under the patents of 1879, and continued: With respect to the commercial success of the invention as tested by these experiments, I find from the report and a supplemental table of the results which has been handed to me as an agreed statement, that out of 100 lamps, some broke down at once, 13 lasted less than 10 hours; 11 more less than 20; 18 more less than 40; and only 6 above 40 hours, of which 4 were unbroken at 60 hours, and of these 4 there is no further record. That is far from commercial success. No system of electric lighting could be maintained, except at an expense which could not practically be incurred, with lamps of such short life as these; and this explains most satisfactorily why Edison never sold lamps made according to the specification of 1879. In considering the sufficiency of this specification it must be remembered that in 1879 there was no trade or business of manufacturing electric incandescent lamps. Lane-Fox, Edison, Swan and other inventors had given much time and attention to the subject, but except such persons there were none who had any special knowledge in the matter. The *dicta* that may be found in some cases that the specification of certain patents must be read as addressed to adepts in the particular trade or business do not apply. For this reason it was essential that the specification should be carefully explicit. It ought to be such as would enable an intelligent working man to make an incandescent lamp without having to try experiments. The Justice then examined the specification on the question of sufficiency of description, and arrived at the conclusion that it was vague and insufficient.

His lordship then proceeded: My opinion is that the patent of Edison's, No. 4,576, of 1879, is invalid—first, because the second claim is for a monopoly of incandescent lamps containing a filament of carbon for a burner, which claim, I think, is far too wide, considering how little Edison had actually invented; secondly, because his specification does not describe a lamp which ever became, or, as I think, could have become, commercially successful; thirdly, because the directions therein contained are so insufficient that no one could have made the carbons he describes without considerable previous experiment; fourthly, because one of the processes described—viz., mixing the carbon with a volatile powder—I believe to be practically injurious if done as Edison directs; fifthly, because the coating with a non-conducting, non-carbonizing substance, if not injurious, is of no practical utility; sixthly, because the

same may be said of coiling the filaments, on which the patentee lays great stress. This patent of Mr. Edison's, No. 4,576, of 1879, has been the subject of litigation in a previous suit between the present plaintiffs and Messrs. Woodhouse & Rawson, who were manufacturing incandescent lamps, and were sued by the plaintiffs for infringement. The case went to the Court of Appeal, and both in the Court of First Instance and in the Court of Appeal the patent was treated as valid, though apparently with some hesitation. I am bound by these decisions, and should follow them, of course, whether I agreed with them or not, if the evidence in the two cases were the same. But that is not so. On one point which Lord Justice Cotton seems to have thought essential, the courts were completely misled. They were given to understand that the carbon burner in the lamp exhibited by Swan before the date of Edison's patent was shaped after and not before carbonization. It is now admitted this was not the fact. It was a carbon made by Carre, and used as made by him without alteration. But, further, I am told that there was no evidence in that case as to the difficulty of making the carbons described in Edison's patent from the description in the specification. I understand that no contest took place as to the sufficiency or utility of any part of Edison's patent, and that nothing like the evidence as to the previous knowledge on the subject was given in that trial which has been adduced in this. With respect to the construction of the patent, the opinion which I have expressed agrees with that of the majority of the learned judges in the Woodhouse and Rawson trial. The case has been brought before me with such an elaboration of evidence on every point that I think myself bound to act upon my own opinion, believing as I do that if the same materials had been before the learned judges in the other case they would have arrived at the same conclusion as I had done. The other patent in question in this action is Chesebrough's, No. 4,847, amended by disclaimer dated November 12, 1884. The specification describes and claims a method of preparing the illuminating portion of an electric lamp, and also a material for the manufacture of illuminating carbons. Shortly stated, the carbon to be prepared is surrounded with a carbon gas or liquid, and then heated intensely by the passage of the electric current. This causes a decomposition of the surrounding hydrocarbon, and the deposit upon the heated surface of an extremely dense form of carbon, such deposit being in greater quantity upon the hotter —that is, the thinner—portions. The specification states that "carbon of the ordinary sort, when heated by the electric current, exhibits points and lines of unequal brilliancy. Carbons prepared by this process when so heated glow with a uniform brilliancy throughout." A French chemist, Despretz, in experimenting on the reduction and volatilization of carbon, discovered that when the carbon was heated in an atmosphere of hydrocarbon this deposit occurred and interfered with his operations; and he describes this in a paper which was published in England some years before 1879. But Despretz did not utilize this product in any way, and his experiments had nothing to do with electric lighting. Assuming that Chesebrough derived his knowledge of the mode of producing this material from Despretz's paper, his invention consists in applying it for the purpose of making uniform the light giving power of a piece of carbon when heated by the electric current; and the beauty and merit of the invention consists in thus enabling an imperfect carbon, by a sort of automatic operation, to improve and perfect itself. I have no doubt that this is a good subject for a patent. I had more hesitation upon the claim for the material, which certainly was not discovered by him; but that is not the whole of the claim. It is for "a material for the manufacture of the illuminating conductors of electric lamps, produced by electricity heating carbon in a carbon gas." That does not prevent anyone from making the same material and using it for other purposes. The claim is really for the use of the material for the burner of an electric lamp. This seems to me equally valid. Another objection—that pencils cut from the lime cylinder coated with carbon would not make effective carbons—seems to me to arise from a misconstruction of the specification. It is not the lime cylinder but the deposit of carbon which is to be made into burners. The defendants have used this process of Chesebrough's, but they say for a different purpose. Their object is to bring all their carbons to one standard of illuminating power, an operation for which they have invented a somewhat cacophonous word—"standardizing." But Sellon, one of their principal witnesses, admitted that the process would cure any inequalities of light giving surface in the particular carbon so treated. These, he says, in their cellulous carbon threads seldom occur. However, I cannot resist the conclusion that the defendants, by this use of the process for carbons of incandescent lamps, are infringing Chesebrough's patent. The plaintiffs' reply in this case was, unfortunately, interrupted. The Attorney-General asked leave, if the Court wanted more assistance on any point, to add somewhat to the reply. I have not thought it right to trouble him further. Every point has been put again and again to the scientific witnesses. Twenty-one of the working days of the Court have been occupied by this case. I have not arrived at the conclusion I have intimated without thought and care, and I do not think that further argument would be a useful expenditure of public time. I must therefore decline to trouble counsel any more in the case. I have been provided with a copy of the print of the shorthand notes. They contain, as is, perhaps, inevitable in such a case, a considerable number of verbal inaccuracies, some of which completely distort the meaning of what was said. The action, so far as it relates to Edison's patent of 1879, must be dismissed with costs. There must be an injunction to prevent any further infringement of Chesebrough's patent, and the defendants must pay the costs of this action so far as it relates to that. The costs must be set off in the usual way.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Aug. 10, 1888.

Mr. G. R. Hislop on Gas Burners.—A New Discovery.—The Increased Demand for Coke.—The Gas Light and Coke Company.—Gas and Whisky.—Manchester Gas.

At the recent meeting of the North British Association of Gas Managers, Mr G. R. Hislop, of Paisley, submitted a report on "Gas Burners for Photometrical Purposes." Three years ago a special committee was appointed by the Association to determine the best standard burner for the rich cannel gas—22 to 28 candle power—usually supplied in Scotland. The subject was remitted to Mr. Hislop for consideration, and the result was the present report. Mr. Hislop remarked that, with regard to the common form of burners, no attempt had hitherto been made to show that the illuminating power yielded by them was affected in any other way than by the pressure, and several devices had been introduced with the object of bringing this to a minimum. No reference had ever been made to the angle of the impinging jets, or to the relative dimensions of flame in relation to quality of gas, which he maintained were indispensable conditions. The fishtail burners, as usually manufactured, had the holes drilled at an angle of from 45° to 60°, apparently without any consideration as to the quality of the gas, and much too high for the quality of the gas he wished to test. He had an extensive series of burners specially made, consisting of sizes 5, 6, 7, and 8, drilled at all angles up to 60°, but he found that, burning the gas at 5-10ths pressure as ordered by act of Parliament for photometrical tests, the No. 7 burner gave the best results with all qualities of gas. A large number of experiments with gases of varying qualities, some of the results of which are given in tabular form, show conclusively that for each quality of gas there is a particular angle that gives the best results; and this is the "new discovery" to which I would direct attention. For example, a gas that gave 17.9 candles with holes at an angle of 18°, gradually decreased as the angular width increased, until with holes at 35° it only gave 15.9 candles. A gas that gave 28.4 candles with an angle of 33°, gave only 25.4 candles with an angle of 20°, and 26 with an angle of 50°. It was pointed out that the causes of these differences are readily explainable by an investigation of the effect of the different angles on the shape of the flame, and that the angle of best results increases with the quality of the gas. A 17.9 candle gas gave the best results at 18°, a 19.8 candle at 20°, and so on up to a 32.6 candle gas, which afforded the best results with an angle of 45°. Mr. Hislop's experiments lead to two important conclusions. The first is that the subject is worthy of further investigation, as it is evident that for every quality of gas it is possible to make a fishtail burner that will secure better results from it than any other; and the second, that the fishtail burners sold for use with ordinary qualities of gas are unsuitable, being as a rule drilled at too wide an angle. It is also evident that a share of the ingenuity which has lately been directed to the designing of new types of gas burners might with great advantage have been directed toward the improvement of burners in ordinary use.

On previous occasions I have directed attention to the increased demand for gas coke. This has been maintained in a remarkable manner during the recent spring. There are very few cases where any of the winter stock is now left on hand. The cause of this fortunate state of affairs has recently been discussed in the columns of the *Journal of Gas Lighting*. As an example, it is imaintained that on Midsummer day last year the Birmingham Corporation had more than 19,000 tons of coke on hand; but at the corresponding period this year they had less than 1,000 tons. A "Spanish Gas Manager" points out that the reason may be that in England gas coke has not sold for anything in proportion to its value as a fuel for many years past. He considers that gas coke is

more than equivalent in value to large steam coals. Based on price considerations alone, it is worth 12 per cent. more; but it has special merits for certain purposes which enhance its value to the extent of about 25 per cent. beyond the price of large steam coals. But yet, he points out, instead of realizing higher prices than steam coal, it sells for a great deal less, and then not easily or generally. So a movement may be going on for bringing gas coke up to its proper value. On the Continent, he considers that the value of coke is rather exaggerated, as it often realizes 50 per cent. more than the cost of coal. If the coal costs 14s. per ton, the coke sells for 21s. It is certainly remarkable that coke should sell for three or four times the value in one country that it does in another, and the matter is worthy of further investigation. Mr. Thomas Fletcher does not consider that coke is gaining ground for domestic uses, not being suitable to the open fireplace as used in England, though it may do very well for the close stoves used on the Continent, and therefore realize its full value in those parts. "A very large proportion of the increase in demand," he says, "is owing to the development of new processes and the improvement of old ones." He goes on to give some valuable information relative to the use of coke under ordinary steam boilers. Forced draught is quite unnecessary, but the firebars are usually set too low. A good average distance is 12 inches clear between the firebars and the lowest part of the boiler. Coke requires to be used as a thick fire, so the whole of this space should be filled with coke. The flues are fitted up with loose firebrick until the space does not exceed 5 inches, so that not only are the burnt gases kept close to their work, but valuable radiant heat is afforded by the mass of bricks.

One reason that has not been mentioned in the above discussion is the endeavors of gas companies themselves to develop a coke trade. Formerly it was not the custom to trouble much about the coke; it was only a residual, and so long as it was cleared out at a very moderate rate the result was considered satisfactory. There is no question but that it does not realize the equivalent of its value as a fuel, and the cause of this is greatly due to the action of the gas companies themselves. If they are content to dispose of it for less than its intrinsic value their customers are not likely to come forward and tell them of their mistake. But lately, on account of the diminished revenue from tar and ammonia, attention has been directed to the possibility of developing a coke trade. The use of coke breakers has become general. Small quantities can be had, and delivered at the customer's residence if required. In many cases the value of coke as a fuel has been advertised by various means, and thus brought to the notice of those who had never thought about it before.

The accounts of the Gas Light and Coke Company for the six months ended June 30th last, have just been issued to the shareholders. The balance of profit is about £566,000 against £602,000 for the corresponding period of last year; but it must be borne in mind that a reduction of 3d. per 1,000 cubic feet was made in the price of gas at the beginning of this year, which represents more than double the deficiency. There is a satisfactory improvement in the receipts for coke and for tar, coals have been rather cheaper, and there are a few other small economies on the expenditure side. So that notwithstanding the reduction in price the Company is able to declare maximum dividends and to carry forward a respectable balance. There is a small increase in the quantity of gas sold, but the usual rate of increase is not maintained. The explanation of this fact is not very obvious. Speaking generally, the reports throughout the country show a satisfactory increase, due in part to the dull and cold weather that prevailed in February and March, and I know of no reason why the Gas Light and Coke Company should be an exception. The consumption of coal during the half year is nearly 900,000 tons, from which about 9,441 million cubic feet of gas have been obtained. Of this quantity 8,815 million have been duly brought to book, leaving 626 million, or about 6 per cent. of the whole, unaccounted for. The yield of products averages 12.1 cwt. coke, 11.2 gallons tar, and 32 gallons of ammoniacal liquor, per ton of coal carbonized.

The connection between gas and whisky will not be very obvious to many readers, but the Corporation of Birmingham know well what it means. A large and important illicit distillery has been discovered in a vault under some houses in that town. The smugglers obtained their light and fuel gratis by means of surreptitious connections made with the main in the street and with the pipes in the premises above. The stills were entirely heated by means of gas. The offenders have up to the present time contrived to evade the officers of justice. Whilst gas companies and corporations are glad to hear of new applications for coal gas, they will probably draw the line at its use for the purposes of the illicit distiller, especially when the said gentleman dispenses with the help of the meter and service layers, and omits the customary notice before commencing consumption.

The Manchester Corporation are not to be congratulated on the purity of the gas which they supply to their customers. According to the report of the official examiner for the past year it appears that sulphuretted hydrogen was present in the gas on 18 different days, that it contains a trifle under 3 per cent. of carbonic acid gas, and more than 37 grains of sulphur per 100 cubic feet of gas. The presence of the carbonic acid means, of course, a considerable loss of illuminating power, and if all that has been said about the injurious effects of sulphur in coal gas is correct, the destruction of gilding, hangings, covers of books, etc., in rooms lighted by Manchester gas must be very rapid indeed. There is no difficulty in supplying gas free from sulphuretted hydrogen, carbonic acid, and not containing more than 12 grains of sulphur per 100 cubic feet. The doings of the Manchester Corporation are worthy of consideration, in connection with the fact that in other towns gas companies have been fined if sulphuretted hydrogen is found to be present on one occasion only, or if the sulphur compounds exceed 20 grains per 100 cubic feet. In making these remarks there is no reflection on the skill of the engineer employed by the Corporation. The most probable explanation is that, with a view of swelling the item of "profits derived from the gas undertaking," the use of lime as a purifying material is altogether dispensed with at Manchester, and, further, that the oxide purifiers are deficient in capacity. It is not unreasonable to imagine that when a gas undertaking belongs to the local authorities the first care would be to provide good pure gas at a cheap rate; but this is evidently far from being the case at Manchester.

A New Method for Protecting Iron from Corrosion.

For something over a decade experiments have been made under the auspices of the Hydrogen Company of the United States to discover a simple, economical and practical method of protecting iron and steel from all ordinary corrosive influences. A large number of patents were secured, and many thousands of dollars spent in the erection of plants at Washington, D. C., Newburg-on-the-Hudson and New York, and some of the results were of the most satisfactory character. Iron that had been treated by the processes referred to effectually resisted the action of nitro-muriatic acid and other severe tests to which it was subjected, while untreated iron was immediately attacked by the acids, and quickly destroyed. But although many of the specimens thus treated gave very satisfactory results, others proved defective, and it became apparent to the contributors to the funds that the exact conditions as regards temperature, quality and quantity of material employed, and duration of treatment had not been so accurately determined that results could be duplicated with unerring certainty, an essential condition without which no process could ever be made a commercial success.

This persistency has, it is said, at last been rewarded with success. The Company succeeded in securing the services of a thoroughly practical and scientific engineer, chemist and metallurgist, Dr. Geo. W. Gesner, who was enabled to discern the defects of former treatments, and to remedy them successfully by new apparatus and processes which have recently been patented. The results were not always uniform, and when satisfactory could not be duplicated with certainty as to the result. All this is now changed, and the results are so uniform and certain that with a few hours of instruction in the manipulation of the apparatus an ordinary laborer, with no technical education and with average intelligence, can produce work of entire uniformity. The plant now in operation is located at East Port Chester, near the extensive foundry of Abendroth Brothers, and consists of vertical retorts with a capacity for the treatment of about 20 tons per day of the Gesner sanitary soil pipe. The time required for each charge is about two hours.

The process is thus described by Gen. Haupt, of Philadelphia. After the pipes have been lowered into the retorts by means of a traveler, the retorts are closed for about 15 minutes until the contents are heated to the proper temperature. Steam from a boiler at 60 lbs. pressure is then introduced into the superheater, which it traverses, and from which it escapes at the temperature of the iron upon which it acts for about one hour. A measured quantity of some hydrocarbon is then admitted with a jet of steam, followed again by a fixing bath of superheated steam, which completes the process. The most extraordinary feature of the operation is that, as Professor Gessner positively asserts, there is no pressure in the retort, and no free explosive gases. The water seals attached to the retorts show only slight oscillations, but not an inch of pressure, and when the covers are removed and air admitted there is no explosion, as there always is when free hydrogen or carbonic oxide is present, and as there always was before Prof. Gesner took charge. The absence of pressure and of explosive gases is a proof that all the operations have been so nicely regulated as regards material used, quantity and time of

application, that a perfect absorption and union of the carbon, oxygen and hydrogen with the iron has been effected.

The protection thus afforded to the iron is not a mere coating, like paint, but an actual conversion, to a greater or less depth, into a new material, just as, in the process of case hardening, iron is converted into steel. When properly treated this material dees not seem to be detachable by pounding, bending, hammering, rolling or heating. The pipes treated at Port Chester have been immersed in baths of dilute sulphuric acid and exposed to the salt air for weeks without change, while untreated pipes were quickly covered with red oxide, or with sulphate of iron. The exact chemical composition of the material produced by this treatment has not been reported upon by Prof. Gesner, but it is probably a carbide, hydride and superoxide of iron. This would seem to be a necessary result if, as stated, the retorts, when opened, contain no free gases, neither hydrogen, oxygen nor carbonic oxide. The plant now in operation at Port Chester has been designed simply for cast iron soil pipe, but Prof. Gesner is preparing plans for a more extensive plant for the treatment of wrought iron and steel, to be erected at South Brooklyn. In the application of this process each specialty will require a plant adapted to it, and a series of experiments to determine the exact conditions as to temperature, quantity, kind, duration, to secure the best results, after which they can be duplicated indefinitely. What the effect is of this treatment upon the tensile strength of the material can only be answered by direct tests, but if the new material should not possess the tensile strength of the untreated iron, as in wires or rods, compensation can be secured by a slight increase in diameter.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Pittsfield (N. H.) Gas Company, having no desire to experience a repetition of the disaster which some months ago wrecked its gasholder, has inclosed the new vessel in a substantial wooden housing.

MR. L. L. BROMWELL, of San Francisco, President of the California Insurance Company, has about completed arrangements for the construction of a gas works in Baker City, Oregon. The plans agreed on involve an expenditure of $25,000. The capital stock has about all been subscribed for. This place, which is on Powder river, is something like 300 miles east of Salem.

WE take pleasure in announcing that Mr. and Mrs. Emil Lenz, of this city, do not get as much solid sleep these nights as was the case during those of, say, a month ago. We submit that the foregoing at first glance appears to be in line with glorying at the misfortunes of others—for insomnia is certainly a misfortune; but the cause of the Lenz family's wakefulness is to be attributed to a wonderfully strong pair of lungs that inflate the chest of a bouncing son, born to his delighted parents on the 19th ult. May he live long and prosper.

MUCH complaint has been made in California that the creosoting works at San Diego and Bellona Harbor, in which many thousands of piles had been prepared for driving in connection with the several harbor improvements now going forward in that section of the country, had turned out large quantities of very poorly prepared material. Those who were opposed to the construction of creosoting works in San Francisco took good care to spread the unfavorable reports, and also tried to strengthen their opposition by asserting that creosoting, at best, was only a makeshift. The obstructionists, however, have received a quietus in a report on the subject recently made to the Harbor Commissioners by their Chief Engineer, Mr. Marsden Manson. The Engineer says that, judging from the specimens—some of which had been submerged for years—examined by him, those that had been properly creosoted and driven had proved a complete bar to the teredo. In concluding his report Mr. Manson said: "An examination of the piles that had been attacked revealed three causes for the trouble. The first was that, when in driving the pile it had been split by the hammer, the limnoria worked its way into the cracks and opened the way for the teredo. In other instances breaks were caused by vessels or other floating objects jamming into the pile. Most important of all was the fact that many of the diseased logs were imperfectly treated." He recommends the establishment of a creosoting works for San Francisco.

THE Gloucester (Mass.) Gas Company is to be congratulated on the good showing made in its return to the Corporation, read on the 8th day of last month. The figures reveal the following as the standing of the Company: Total assets, $89,047, chargeable as follows—land, water power, etc., $27,000; street mains, meters, etc., $35,300; cash and debts receivable, $10,297; manufactures and merchandise, $3,049; loans, $13,400. Liabilities, paid in capital stock, $62,300; bills payable, $664.

A SOUTH CAROLINA correspondent writes: "A certificate of the incorporation of the Spartanburg (S. C.) Gas, Electrical and Power Company was issued, on August 17th, to Messrs. A. H. Leftwich, of Greensboro, N. C., and Andrew E. Moore and Henry E. Heinitsh, of Spartanbug. Mr. Leftwich, who is President of the Gas Company at Greensboro, N. C., has purchased the old Spartanburg rosin gas plant, and will alter it at once to a coal gas works. The first move made was to reduce the selling rate to $2.50 per thousand cubic feet ($5 per M. was the old schedule figure) to private consumers. Mr. Leftwich is in treaty with the City Council for a municipal contract, which undoubtedly will be agreed to. This contract provides for the furnishing of 50 public lamps at the rate of $25 each per annum, the Council to have the option, on previous notice, to change therefrom to the electric system, provided fifteen arc lights are maintained, the total annual payment therefor to be $1,800. As soon as contracts can be awarded the mains will be extended to Wofford College and up Congress street. Mr. Leftwich and his associates are evidently earnest in their intention to give Spartanburg good and cheap gas, and the residents are in great glee over the fact."

AT a special meeting of the New Bedford (Mass.) Gas Light Company, held August 20th, it was decided to increase the capital stock to $300,000—an addition of $50,000. This action was taken in order to meet the cost of increasing the capacity of the electric lighting division of the Company's business. In compliance with the Massachusetts statute the new stock will be sold at auction.

WHEN the City Council of Camden, N. J., arranged for the lighting of the streets for the current year, it was agreed that the Camden Gas Light Company was to perform all the work save that required in the illumination of Cooper, Market and Federal streets, and Broadway and Kaighn avenue, which were to be lighted by the electric company. The understanding was that 50 arcs would be equal to this task, and that 180 gas lamps would be thus displaced. Having obtained an inch, the electricians, as usual, sought to secure a foot, and insisted that as 36 arcs would accomplish the lighting of the five named streets, they should have the right to install 14 additional arcs at other named points in the city. President Archer, of the Camden Gas Company, negatived this interpretation of the contract, and said that if a greater number of gas lamps than the 180 originally agreed on should be cut off the Gas Company would not perform any part of the lighting.

WE are sorry to say that the gas war between the Lowe Gas and Electric Company and the old Los Angeles (Cal.) Gas Company has taken on a very mean shape. Newspaper readers do not wonder greatly when politicians of the pot house stripe seek to advance the cause of their candidates by resorting to the language and manners of the blackguard, but when the backers of commercial enterprises stoop to the same tactics we think it is time to call a halt. The shortsightedness, to say nothing of the ineffectiveness of such a plan of campaign, has been proven a score of times within the last 10 years; but there are none so blind as those who refuse to see. The Lowe Company's managers may think that a good point is scored when they refer, in big type in the local public prints, to their competitors by characterizing the latter as a "Lying Gas Company," "a set of monopolists," "People whose extortionate practices in the past have condemned them in the minds of their fellow citizens," etc.; but we rather think that those on the heights surrounding the place of combat will deny the virtue of such a plan of attack. Nor, on the other hand, do we think that the old Company gains much ground when, in making counter charges, it asserts that the Lowe Company's meters are fast, and that people do not obtain from it the quantity of gas that is shown to have been consumed from the face of the bills rendered. Of course, our sympathies are with the old Company in this affair, for the Lowe charter for Los Angeles seems to have been obtained by the usual methods, which are familiar to Professor Lowe from his old-time practice therewith. Los Angeles had as much need of two gas companies as, for instance, the city of New York would have for two acqueducts of the size now under construction, both to conduct to town the quantity of water that could easily be taken care of by one; but that is really neither here nor there, so far as the type of opposition campaign at Los Angeles is concerned. It is better not to throw stones of too heavy a weight, for the resultant bruises are sure to cause suffering that is likely to last; and it is said that stone bruises are hard to heal. The old Company might better adhere to the policy of printing the cold facts in regard to the peculiar financial operations of its rival, permitting the

other to seek refuge in the turbidity of Billingsgate Harbor. Again, the old Company, by putting its price at the lowest figure consistent with an effective and honest service, and by not seeking to curtail the business of its rival, which the latter shall have secured from instituting a ruinously low rate, ought to have no fear of the ultimate result. In proof of this we submit the respective instances at Louisville, Ky., and at Atlanta, Ga. Business men do not care to continue long in a trade which fails to return a reasonable profit.

THE San Bernardino (Cal.) Gas Company will, when the improvements now underway are completed, be in position to send out 120,000 cu. ft. per diem. The new plant is to have three benches of sixes, whereas the present contains but two benches of threes.

ARTICLES incorporating the Coshocton (O.) Electric Light and Gas Company have been filed. The Company is capitalized in $10,000.

THE C. M. Keller adjustable coke crusher continues to find favor with the gas men. Recent shipments included orders from the Quincy (Ills.) Gas Light and Coke Company, the Citizens Gas Light and Heating Company, Bloomington, Ills., and the Youngstown Coke Company, Uniontown, Pa. Since this crusher was placed on the market orders for it have been received from 36 different gas companies, while 19 have been taken by colliery operators, coke manufacturers, and coke and coal dealers.

THE Citizens Natural Gas Company of Columbus, Ind., will try a hird time to strike a profitable gas flow in that vicinity. A contract for the drilling has just been awarded. The two ancient ventures resulted n flat failures.

THE Rochester (N. Y.) authorities have decided to discontinue the use of electricity (the Edison system) in the lighting of the City Hall. A year ago the Edison Company, under the pledge that incandescent lighting would not cost more than the gas did, induced the Trustees to make the experiment, and this is the verdict of Trustee Atkinson (who spoke for a majority of the Board) in respect of their experience: "Our action in coming back to gas was taken solely in the interests of the county, and for the sake of economy. We believe that gas will afford a sufficient light at a cost of $1 where the electric light would cost us $3. We have figures warranting the statement that the gas for the court house and jail will not cost over $1,000 per year, while the electric light costs nearly three times that sum. The bill for February last was simply scandalous." The Rochester Trustees, who speak from experience, seem to differ with Supervisor-at-Large Quintard, of Brooklyn; but then the latter has not had any "experience" in the incandescent line, as yet.

AT the annual meeting of the Norwalk (Conn.) Gas Light Company the following officers were elected: Directors, D. P. Ely, E. C. Lockwood, Geo. B. St. John, P. L. Cunningham, Chas. F. Osborn, G. M. Holmes, L. C. Hanford, W. C. Street, and W. A. Curtis. President, Dudley P. Ely; Secretary and Treasurer, Geo. B. St. John. It is possible that next spring the Norwalk plant will practically be rebuilt.

THE contract for lighting the streets of Summit, N. J., has been awarded to the New York and New Jersey Globe Gas Light Company. The price agreed on for the service is $2,300 per annum.

THE Richmond (Va.) authorities have appropriated the sum of $25,000 to be expended in improving the city gas works. Better than nothing, even though tardily and grudgingly given.

THE Salinas City (Cal.) Gas and Water Company has determined to operate a 30-light (Thomson-Houston arc type) electric light plant in connection with its gas supply. If everything goes along smoothly the new departure will be an accomplished fact early next month.

THE Burlington (Iowa) City Council has ordained that hereafter plumbers and gasfitters, and all others whose calling obliges them to open the public streets for the purpose of tapping any gas or water main or sewer drain, etc., shall take out a license, to last for one year, the same to cost the recipient the sum of $25. Having received the license, the holder thereof, prior to opening any particular street for the purpose of making a pipe, drain, or sewer connection, is required to furnish a bond, the sum of which is to be determined by the nature of the situation and surroundings, in regard to the possible amount of damage that might be caused by any neglect on the part of the contractor or licensee. A permit for each opening must be obtained, the fee for this permit to be $1. The ordinance contains many other provisions, some of which really seem to have been formulated with the idea of causing the Burlington plumber's lot to be other than a happy one.

THE Allan Line Steamship Norwegian has arrived in Montreal from Glasgow. The vessel's freight consisted largely of iron materials to be used in the construction of the gasholder which is to replace the one that was destroyed last May by an explosion at the works of the Montreal Gas Company.

THE town of Darby, Pa., was visited in the last week of August by a fire that at one time threatened the complete destruction of the local gas plant. Flames broke out in the carding room of the weaving and spinning mills of Messrs. Geo. Grayson & Co., whose factory is but a few yards from the Gas Company's holder; and as the latter was pretty high in the air, many feared a disastrous explosion. The gas was allowed to escape at a point or points about half a mile distant from the works. The holder was saved, although considerable damage was occasioned to the manufacturing plant.

PUBLIC LIGHTING AT WILMINGTON, DEL.—In accordance with the terms of the invitation, the Street and Sewer Commission of Wilmington, on Aug. 22, opened the following bids for the public lighting of the city: Wilmington Coal Gas Company, 500 lamps or less, $19 each per annum; 600, at $18; 700, at $17.50; 800, at $17. If a contract for but one year was granted (the specifications called for bids on one, three, and five years), 25 cents per lamp would be added to the quoted price. The Standard Automatic Gas Light Company (Balt., Md.) submitted the following: 16-candle power (gasoline) lights, at $19.20 for 1 year, $18.70 for 3 years, and $17.60 for 5 years. The Company would make no charge for putting up the lamps, and offered the city the option, at the expiration of five years, of purchasing the posts and lamps at the rate of $10 each. The Reflection and Light Company (Phila., Pa.) made a bid (on 16-candle power gasoline lamps), of $19 for 1 year, $18 for 3 years, and $17 for 5 years. In addition, a rental of $1.50 for each lamp and post was asked for on a yearly contract, this to be reduced to 75 cents should the contract continue for 5 years. Messrs. Phillips & Kane, of Wilmington, wanted $18.25 for a yearly contract, but would take $17.99 for a term of 3 or 5 years. They also asked $6 for each post and $5 for each lamp. The Pennsylvania Globe Gas Light Company asked $21 for each 18-candle power gasoline lamp supplied. The Wilmington Electric Light Company submitted the following: 15-candle power incandescent lamps, $16.75 each per annum; 20-candle power, $17.50; 25-candle power, $18.25; 30-candle power, $19.65. They would furnish 2,000-candle power arcs for 50, 45, or 40 cents each per night, according to the life of the contract. Another proposition submitted by the electricians, based on a 5-years' allotment, was to replace the present gas and gasoline service with 35 high candle power arcs and 1,179 incandescent lamps (22 candle power), in consideration of an annual payment of $26,005.75. The bids were taken under advisement.

PRESIDENT CAMFIELD'S OPINION AS TO WHOM THE CREDIT BELONGS.—The following letter explains itself:

"OFFICE OF REES & CAMFIELD, ANNISTON, ALA., Aug. 18, 1888.

"To the Editor AMERICAN GAS LIGHT JOURNAL:—My attention has been called to the following article, taken from one of the August issues of a New York paper. The article reads: 'The coal gas plant just completed for the Anniston (Ala.) Gas and Light Company, by Adam Weber, merits the attention of gas engineers not only on account of the completeness of the appointment and excellence of the work, but also on account of the rapidity with which the work was completed. The machinery was contracted by Mr. Weber to the Continental Iron Works, which surpassed itself in turning out the beautiful iron work. It contains, among other new and modern machinery, the Connelly street governor, a station meter from the American Meter Company, Smith & Sayre exhausters, and an F. C. & A. G. Rowland improved vertical engine. The gas generating plant consists of three benches of fives upon Adam Weber's recuperative system for small gas works. The contract was awarded April 30, 1888, and the gas was turned on June 25, 1888, beating, without exception, the record of quick gas works erection. The following extract from the Anniston *Hot Blast*, July 8th, shows what the public at large think of the gas and gas works; "'With the lighting up of the lamps last night the Anniston Gas and Light Company fulfilled its obligations toward the city and completed its share of the contract. No one can gainsay the assertion that the work has been done in a most satisfactory manner; that it is complete in all its details, and that it was expedited in a manner which astonished the public. Many were of the opinion that under the time allowed the Company for the

completion of the undertaking it would be impossible for it to supply the city with gas, or if this were done it would be from a plant patched up in such a way as to be sure of rejection by any expert gas manufacturer. The works, as already described in the *Hot Blast*, are models of perfection and finish, with all the conveniences, appliances and latest improvements and mechanical devices for the manufacture of pure illuminating gas. The Anniston Gas and Light Company spared no expenditure of funds to give Anniston a plant of the capacity asked, which would meet the Company's desideratum, and which, at the same time, is so constructed as to be easily enlarged proportionately with the increase of population. Of the light itself not a word of complaint has been received or heard. It is fully up to the candle power agreed upon, and its rays are soft and brilliant even under a reduced pressure. Mr. Adam Weber, proprietor of the Manhattan Firebrick and Enameled Clay Retort Works, who received the contract for the erection and construction of the buildings and the entire apparatus, is entitled to great praise for his unflagging interest and push in completing the work in so short a time. He promptly met the exigencies of the situation, and furnished materials which would be a credit to any metropolis."'

"Now, Mr. Editor, in view of the above, I feel it my duty, as President of the Anniston Gas and Light Company, to write you that the credit of designing and building one of the best gas works in the United States, as well as completing them in the shortest time yet made in any similar enterprise, may be placed where it properly belongs. To Mr. W. H. Hayden we are indebted for the *entire* work, and to him *alone* belongs all the credit; and too much praise cannot be awarded him for his unflagging interest and push in completing the work in the very short time allowed by the city. I do not think Mr. Weber ever visited Anniston in any capacity; certainly, I never either saw or heard of him until my attention was called to the article referred to. Mr. Weber states that the contract was awarded April 30, 1888, when it really was executed and signed March 26, 1888—the foundations were laid and the building well underway on April 30; but it is not surprising that Mr. Weber or anyone else should refer to our works, and wish to have the credit of designing and building them, because they have been examined by experts and pronounced almost perfect. Again, the writer of the article displays ignorance in the premises when he states that the Anniston Gas and Light Company spared no expenditure of funds to give Anniston a plant of the capacity asked, etc. This credit belongs to the New York Contract Company *alone*, and, as you will see by the letter head inclosed, that Mr. Hayden is its chief engineer. The Anniston Gas and Light Company was not known or formed until after the works were completed. Then, after the works had been approved and accepted by the city, the New York Contract Company sold the works to the Anniston Gas and Light Company. Mr. Weber, of course, is certainly entitled to credit for the expeditious manner in which he furnished a portion of the machinery from designs given him. Hoping that you will publish this letter in connection with the inclosed article, that justice may be done to all concerned, I am, Very truly yours,

"C. H. Camfield Prest. Anniston Gas and Lt. Co."

When "Uncle" Jerry Howard, of Dubuque, Iowa, was slowly wiping away certain damp spots on his chin—the day was exceedingly hot—preparatory to bidding good-bye to the group of friends who gathered around him on July 5th in the saloon of the steamship Pennsylvania, he firmly asserted that the fraternity would, through the columns of the Journal, hear from him frequently during his European wanderings. We have waited in patience, but not in vain, for at last we are able to say that he has been heard from, his location (on Aug. 2) being the city of Cork, Ireland, where, as usual, his mind turns strictly to business. We infer this because he forwarded us a marked copy of the Cork *Examiner*, the pencil markings on which called attention to a flaming advertisement detailing the prospectus of the "Metropolitan Electric Supply Company, Limited." Americans, and particularly Americans interested in electrical schemes, are supposed to lead the world in the matter of preparing attractive advertisements; but we grudgingly admit that the organizers of the "Metropolitan, Limited," can give our home folks points in this respect. We note among the list of Directors the name of Mr. J. Spencer Balfour, which shows that one of that family now so notorious in English-Irish politics at least believes in the value and potency of Irish money, when the latter seeks rest (it may be forever) in the treasury of English commercial enterprise. It is no wonder, therefore, that Uncle Jerry looks upon the prospectus of the "Metropolitan, Limited," with suspicion. What? a Balfour in the Directorate! That settles it. In the meantime, we hope to again hear from Uncle Jerry before he steams out of the Cove on his return to the biggest country in the world.

Philadelphia advices, dated Aug. 23, state that on the afternoon of the 22d, a gasholder exploded in the Tacony works of the Disston Company. Several persons received slight injuries. Beyond this mere statement we are unable to go at present.

Mr. D. T. Roots, of the firm of Messrs. P. H. & F. M. Roots, Connersville, Ind., writes: "We are pleased to say that we have had a very good trade in our specialties this season. Amongst our shipments to gas companies we find the following: Washington, D. C., 2 exhausters (with engine on same bed-plate), capacity of each machine, 3,800,000 cu. ft. Also, 2 No. 5 blowers (combined system) for their water gas plant. Dayton, O., one exhauster, capacity 2,245,000 cu. ft.; Washington, Ind., one, 172,000 cu. ft.; Central, N. Y., Milwaukee, Wis., and Cleveland, Ohio, one each, of a capacity of 3,800,000 cu. ft.; Trinidad, Col., one, 330,000 cu. ft.; Texarkana, Tex., one, 172,000 cu. ft.; Henderson, Ky., one, 172,000 cu. ft.; Kerr Murray Company, Fort Wayne, Ind., one, 330,000 cu. ft. Some of the orders now on our books are the following: From the Secretary of the Western Gas Association, Mr. A. W. Littleton, Quincy, Ills., one machine, with a capacity of 650,00 cu. ft.; the Laclede Company, St. Louis, Mo., one exhauster, engine, pipe fittings, gas and bye-pass valves—all to be 20 inches in diameter—and governor, complete, with a capacity of 3,380.000 cu. ft.; Fort Smith, Ark., one exhauster, including attachments enumerated in the foregoing, capacity 330,000 cu. ft.; one exhauster to the East Chester Company (Mt. Vernon, N. Y.), capacity 650,000 cu. ft.; one exhauster, with engine, pipe fittings, valves, etc., 16 in. diameter, to St. Paul, Minn., capacity, 2,245,000 cu. ft.; one exhauster, etc., to the Stacey Mfg. Company, Cincinnati, Ohio, capacity 172,000 cu. ft.; and a No. 5 exhauster, capacity 1,000,000 cu. ft., to Messrs. Colgate & Co., Jersey City, N. J." A rather lengthy list of shipments and orders, but positive evidence to the business of the Messrs. Roots, and to the wonderful prosperity of the gas industry as well.

A Certificate incorporating the Standard Gas Company, of Tonawanda, N. Y., was filed last week. The organizers propose to manufacture and distribute gas for lighting and fuel purposes, and to carry on the business of electric lighting as well. The concern is capitalized in $25,000. The Directors are Messrs. George P. Smith, B. L. Rand, George Herschell, Franklin Getz, Augustus J. Hathaway, Nicholas Beckwith, and Frank C. Longnecker. We were of the opinion that Tonawanda had a pretty well-managed Company now in operation. Are we wrong?

Mr. C. M. Keller, of Columbus, Ind, has put on the market a cheap and serviceable drip pump box. Write to him for one of his illustrated circulars regarding it.

The proprietors of the Knoxville (Tenn.) Gas Light Company are extending and overhauling their pipe lines. It is on the card that the Company contemplates returning to the manufacture of coal gas pure and simple.

It is said that much dissatisfaction exists in Cambridge, Maryland, over the recent increase there in gas rates to $3 from $2.50 per thousand cubic feet. The local merchants insist that if the old rate is not restored they will at once organize an electric light company.

We understand that the capitalists behind the supply of electric light in Fargo, Dakota, have refused to stand any further loss, and that the plant was shut down about a fortnight ago. Dr. Teet, the Company's former Superintendent, has resigned.

Last month a test was made in the office of the Charlestown (Mass.) Gas Company for the purpose of selecting the naphtha burner best adapted for use in the naphtha lamps employed in lighting a certain section of the Charlestown public lighting district of Boston. Among those present were Mr. Toland, Supt. of Lamps, Messrs. Neal and Coyle, of the Charlestown Gas Company, and Ald. Kelley. Three varieties of burners were tested. Of these the Fitzgerald specimen afforded 26 candles, the Lee, 25 candles, and the Berry, 15½ candles.

The Cincinnati illuminated Centennial Exposition is a great success in every respect; at least so several of the fraternity have said to us.

The City Council of Newark, N. J., has accepted the Gas Companies' proposition in the matter of the price to be paid for supplying gas to the public buildings and the street lamps for the ensuing 3 years and 6 months—the remainder of the life of the old contract. This action will save to the city several thousand dollars per annum.

THE Princeton (Ind.) Light and Water Company has been incorporated with a capital stock of $50,000. This place is the capital of Gibson county, and is on two lines of railway. It is 27 miles north of Evansville, and 24 miles south of Vincennes.

THE corporate title of the Coshocton (O.) Gas Light and Coke Company has been amended to that of the Coshocton Light, Fuel and Power Company.

IN further explanation of the action of the Newark (N. J.) Gas Light Company, in voluntarily reducing the rate for gas supplied to the city, although the contract under which gas was being supplied still had 3½ years to run, it might be said that hereafter each street lamp will be maintained at an annual charge of $19 instead of $20, and that gas to public buildings will be laid on at $1.50 instead of $1.75 per thousand cubic feet.

THE following proposition was submitted by the Macon (Ga.) Gas Light and Water Company, in response to a request from the authorities for bids to light the city offices, engine houses, etc.: "We will furnish gas of as good quality as any other bidder, by meter measurement, for one year from August 1st at 90 cents per thousand cubic feet, and will guarantee a price after that, for 5 years, not to exceed $1.50 per 1,000. As we have contracted for an incandescent and arc electric plant, we will furnish you 20-candle power incandescent lights for your offices, where desired, at $1.25 per lamp per month. Will be ready to supply this by Oct. 1st. Arc lights for your bridge and market we will supply at $12.50 each per month. Should we supply the entire lighting with both gas and electricity, a discount of 10 per cent. would be allowed on the incandescent lights." The Brush Electric Light and Power Company also submitted propositions, the former offering arc lights only at the rate of $12 each per month, while Mr. Van Steenbergh, representing the opposition strikers, offered a high candle power gas (we wonder if its quality was to be "at least equal" to some of that supplied under the Van Steenbergh regime in a certain part of New York State a few years ago) at the rate of $1.25 per thousand. When the propositions had been discussed, the Council ordered that a contract for the balance of the year be made with Mr. Boardman's Company. From the limited time for which the contract was granted we surmise that the authorities are only waiting to take advantage of the completion of the Macon Company's electric plant.

THE Municipal Gas Company of Albany, N. Y., will in all probability make a 50 per cent. increase in its capital stock. At any rate, the stockholders are to meet on the 12th inst. for the purpose of determining whether an issue of $500,000 of new stock shall be made. The Directors are anxious to consummate the purchase of the West Troy works, negotiations for which were carried on some time ago. The electric light operators in Albany do not seem to trouble the Municipal folks very greatly.

ABOUT mid-August a fire broke out in the engine room of the Columbus (O.) Thomson-Houston Electric Light Company, and the light of the future was squelched for a time. Much confusion resulted, particularly in the business portion of the city. The plant was badly damaged by water.

WE are informed that the Boston (Mass.) Gas Light Company has awarded to Mr. Adam Weber a contract (without competition) for the furnishing of the retorts and material for the erection of a plant of 4,00,000 cu. ft. per diem capacity. The benches will be fired with his modern recuperative furnaces.

THE Medina (N. Y.) Gas Works was the scene of an explosion on a recent date, but the supply of gas to the village was not interfered with thereby. An employee named Alport was seriously injured.

THE Port Huron (Mich.) Gas Company's new holder (to store about 100,000 cu. ft.) will be completed this fall. The proprietors of the Company are quite well satisfied with the outlook.

THE Comptroller of Allegheny City, Pa., asks for sealed proposals for the lighting by electricity of the streets, parks, and public buildings of the city, the competition to close at 3 P.M. of the 6th inst. The street lighting is to be performed by arc lamps (2,000-candle power), while incandescent lamps (16 candle power) are to be employed for illuminating the public buildings. The arc lights are to be kept in duty from dusk to daylight. At the same time, proposals will be received for furnishing the city with an electric plant to be operated by the corporation. Proposals should be addressed to James Brown, Comptroller. The invitation states that the contract, if awarded to an individual or firm, is to last for one year, and that the successful bidder is to be required to have the plant in operation on or before the expiration of 120 days from the signing of the contract.

Asphalt in Venezuela.

The American Consul at Venezuela, in the course of a report on the asphalt deposits of that country, states that ever since the early Spanish explorations the existence of asphalt in Venezuela has been recognized, and that of coal suspected; but it was not until after the erection of that country into an independent republic that these deposits began to attract attention.

In the year 1834 the Indians of the Goajira were making incursions into civilized territory, near the river Tocui, and during one of these raids various cattle owners from the town of Mojan, with a detachment of men, mounted and armed, began an exploration of the forests which extend from the westward of that village as far as the foot of the mountains. Their object was to search for cattle which had been stolen by the Indians, and in the course of their investigations they encountered a phenomenon previously unknown to anyone. In the side of one of the banks of a gully was an aperture resembling a large cave, which shot forth without intermission smoke, flames, and burning cinders. The exploration here terminated, and on the return of the party its members gave their versions of the circumstances of the discovery of what they termed a volcano.

The Government did not then occupy itself with the investigation of the position and character of this phenomenon, nor were there any individuals willing to undertake such a difficult exploration through large uninhabited forests, intersected in all directions by deep gorges. The belief in the existence of a volcano became, however, universal, and 15 years after the first discovery various residents of Mojan stated that for several days following the earthquake of May 3, 1849, there was seen in the direction of the mountains of Perija a great cloud of smoke during the day, and at night a splendid brilliancy. Neither at this time did the Government take any measures to ascertain the facts, and the public in general did not much occupy itself with the phenomenon, following as it did in the wake of a public calamity.

Later, however, after repeated efforts on the part of various individuals, the Government was induced to appropriate a small amount for purposes of exploration. From the Sierra of Perija, in the part nearest the lake to the west of Maracaibo, stretch in a N.N.E. direction the hills called the Sierra de Tule, whose elevation is not very considerable, and with an extension of about 50 kilograms. To the west of these hills runs the river Tucoy, and on its east side are the headwaters of the rivers Tule and Riocito. The Tule, which is the larger, begins its easterly course at the northerly part of a cordon of low hills known as the Sierrita de los Guineos. It follows in this direction until below Guasdual, 15 kilometers from the Sierra de Tule, and then turns to the northeast for 30 kilometers, passing Irragori and arriving at the swamps of Tule, where it deposits a portion of its water. From this swamp its course is to the north for more than 30 kilometers, and it then empties into the river Tocuy at the distance of one league from Cano Negro. The river Riocito, commencing about 15 kilometers from the Tule, follows approximately the same course as the latter until its junction with the Tocuy.

Neither the Sierra de Tule nor these two rivers are found on the map of the State constructed by Codazzi previous to 1830, nor in other maps made subsequently, which, however, have for a basis the work of Codazzi. Beside the range known as the Sierrita de los Guineos there are two others of slight elevation, and somewhat distant one from another, the one beginning near the river Tule, and the other near Los Ranchos de Guasdual. The general direction of the road from Maracaibo to Irragori is from east to west, with a very slight northerly inclination, the distance being about 80 kilometers. The road is almost level, with a barely perceptible decline from the Sierra to the lake. A cart road could be easily constructed, and should a railroad be projected there would be close at hand the best kind of wood for that purpose.

At the beginning of the exploration of the district situated between the Sierra de Tule and the river of the same name, attention was drawn to the numerous croppings of asphalt noticed at the foot of the Sierra de Guasdual. These croppings begin above Matuzalen and following parallel to the Sierra, on its eastern side, as far as its extremity. All these deposits of asphalt are found in various stages of condensation, none, however, having the solidity of those of San Timoteo, and the swamp of Mene on the east coast of the lake. The deposit of Matuzalen is the principal, having 60 meters of length and from 10 to 15 of breadth; and the force with which it spouts up raises it more than half a meter above the level of the ground. At a distance of 30 kilometers east of Irragori, near the road leading to Maracaibo, and on an estate called Matapalo, is found a large asphalt deposit of an area of about 6,000 square meters.

THE AMERICAN
GAS LIGHT JOURNAL

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PROPRIETORS.

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LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

MONDAY, SEPT. 3, 1888.

The Market for Gas Securities.

The market for city gas shares has more than kept pace with the stiffening in values in the general share market. Consolidated not only held the advance of a fortnight ago, but improved on the previous figures. To-day (Aug. 31) it is bid for at 81, with no seeming disposition on the part of holders to accept that figure. It is bound to go higher, and speedily, too. The most notable event of the fortnight, however, is the jump in Mutual gas, which is being freely bid for at 100, an advance of 8 points over the last reported public sale. Why Mutual should have remained so long below par is somewhat of a mystery. The Company enjoys a good business, its interests are conservatively managed, and its relations with the Consolidated are harmonious. This is a good stock to purchase. Brooklyn shares are held at higher figures, but old Brooklyn looks the most tempting thing on the list, and Nassau also offers a good opportunity for profit. Baltimore Consolidated is about as before. Washington (D. C.) gas sold last week at 200, and more could be readily disposed of at the same figure. The game of see-saw in Chicago Trusts is still being played, but the spring end of the log seems to be out of order. Laclede gas is strong. Anyone disposed to part with 50 shares or under might find a purchaser by writing to this office. The full market price will be paid for it. The Boston situation shows no decided change. The general market still seems to be all in favor of the holder.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

SEPTEMBER 3.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	81	—
Central	440,000	50	—	60
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	110	112
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	100	—
" Bonds	1,500,000	1000	101	103
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	105
Citizens	1,200,000	20	—	50
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	135	136
" Bonds	300,000		—	106
Peoples	1,000,000	10	72	74
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	82	84
Nassau	1,000,000	25	—	106
" Ctfs	700,000	1000	98	100
Williamsburgh	1,000,000	50	125	126
" Bonds	1,000,000	—	111	112

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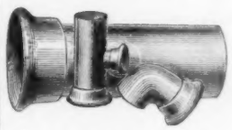

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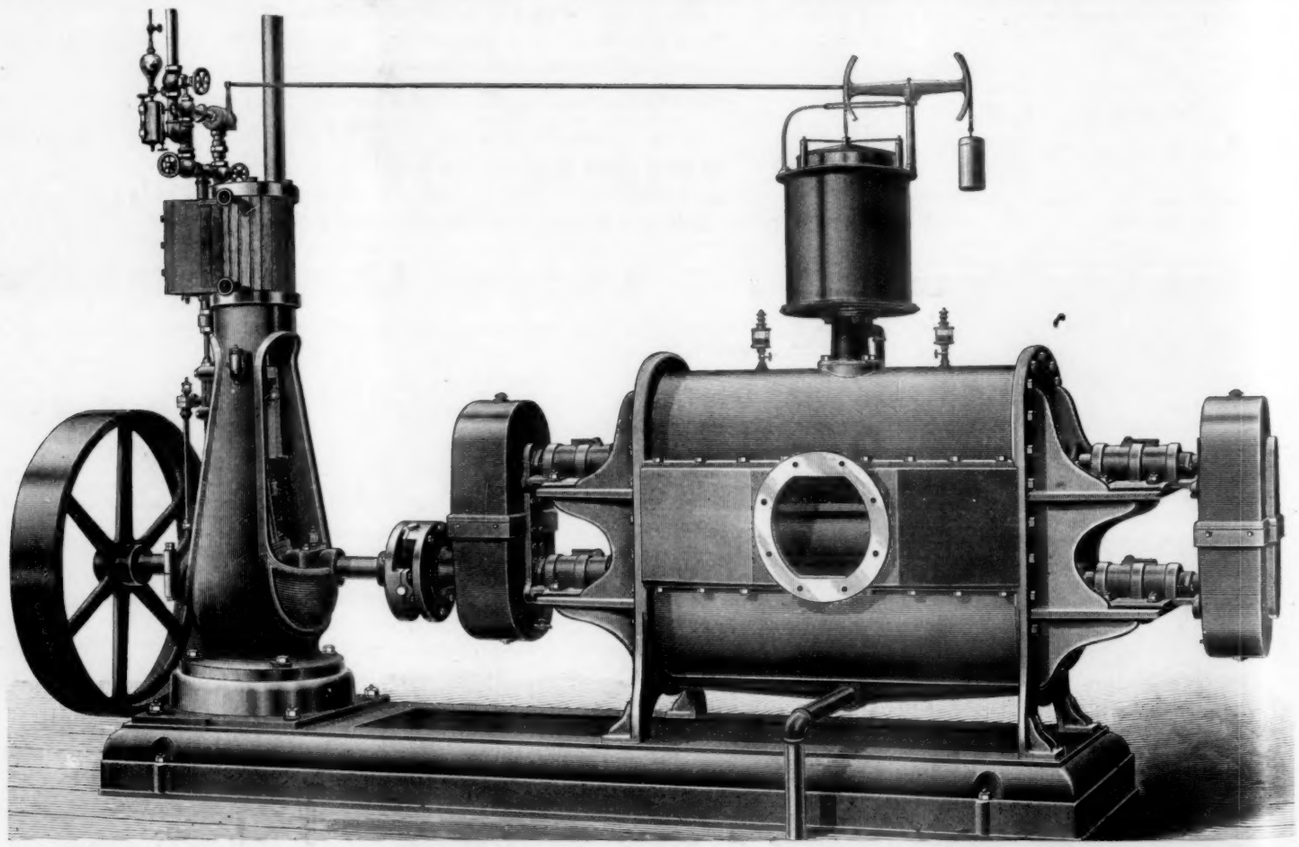

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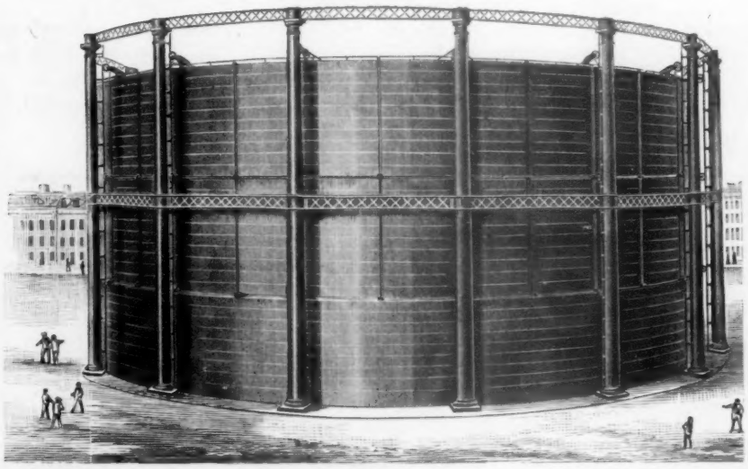

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No. 1,	50,000	to	100,000	cu. ft.	per	24 hrs.,	3	ft.	square,	5 ft. deep.
No. 2,	"	"	125,000	"	"	"	4	"	"	" "
No. 3,	"	"	250,000	"	"	"	5	"	"	" "
No. 4,	"	"	500,000	"	"	"	6	"	"	" "
No. 5,	"	"	750,000	"	"	"	7	"	"	" "
No. 6,	"	"	1,000,000	"	"	"	8	"	"	" "
No. 7,	"	"	1,250,000	"	"	"	9	"	"	" "
No. 8,	"	"	1,500,000	"	"	"	10	"	"	" "
No. 9,	"	"	2,000,000	"	"	"	12	"	"	" "
No. 10,	"	"	3,000,000	"	"	"	15	"	"	" "

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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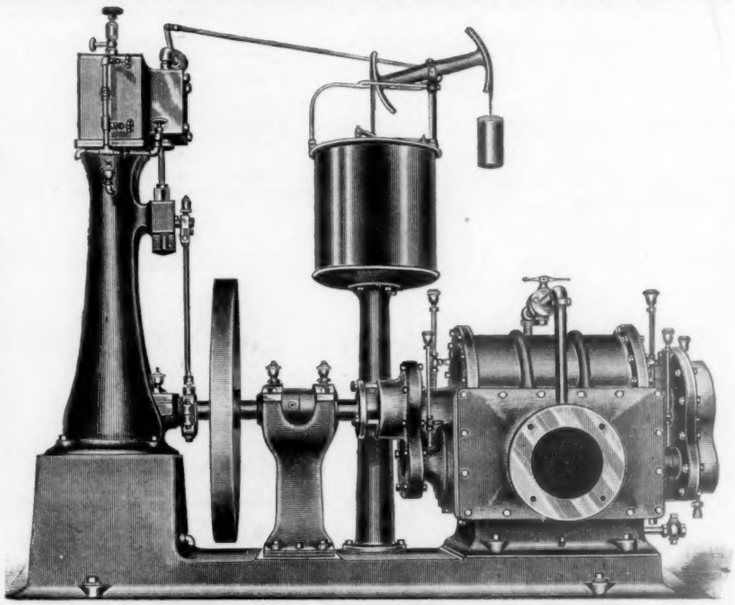

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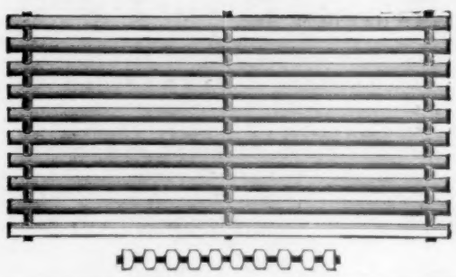

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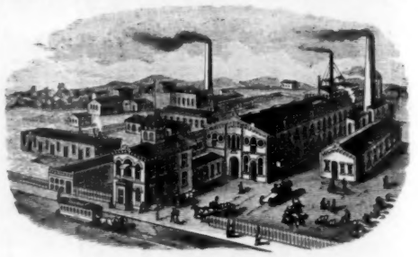

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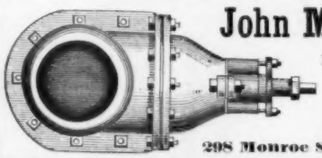

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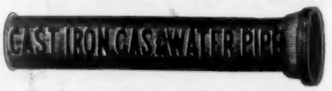

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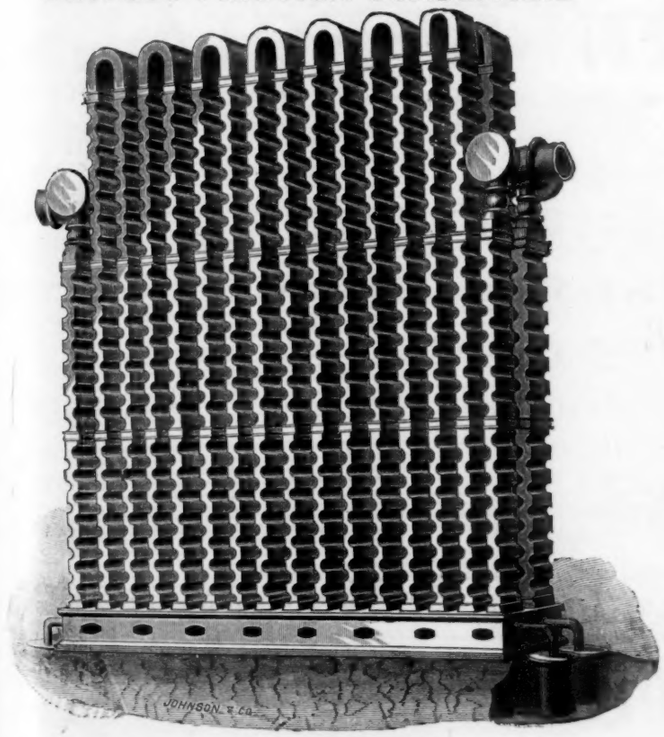

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

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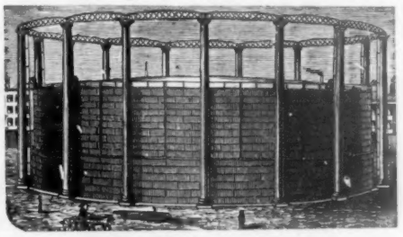

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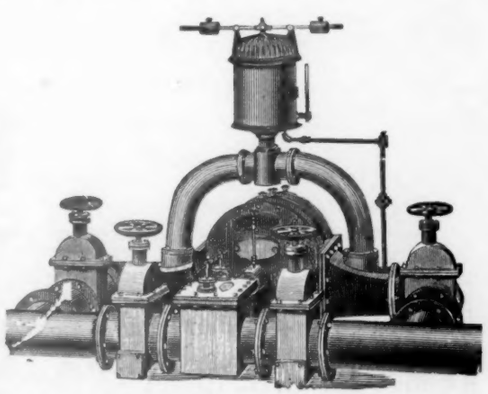

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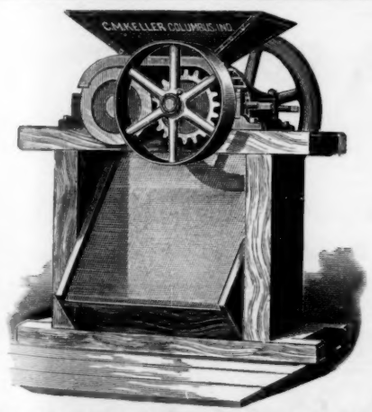

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S. S. STRATTON, Mang'r, Chicago.

SOLE MANUFACTURERS OF THE

"SUN DIAL" GAS STOVES,

The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 3 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¾ in. supply pipe should be used where the pressure is 1 in. or over.